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PARTICULARS OF NEW SHIPS.

FULL DETAILS OF THE FLEET OF LAKE FREIGHTERS THAT WILL KEEP ALL THE SHIP YARDS OF THE LAKES BUSY DURING THE COMING WINTER.

Orders for four or five more steel vessels to be built during the coming winter will undoubtedly be closed shortly by the American Ship Building Co., as there is considerable figuring going on, but in the meantime the full particulars of nineteen that are under contract, shown in the accompanying table, will prove interesting. The table deals only with vessels to come out next spring. The American company now has under construction four vessels of Canadian canal dimensions for Atlantic coast trade (Wolvin boats) and a 6000-ton lake freighter (Eddy steamer at Detroit), but these are not included in the table, as they will all be finished before the close of navigation this year. The fleet of nineteen under order for next year (all but two of them steamers), will have a capacity on 18 feet draught of 86,900 gross tons of ore per trip, or about 2,175,000 tons for a season. Their aggregate value is $3,935,000 and the total horse power 25,000. About 37,000 tons of steel, including boiler plate, will be used in their construction. These new vessels are nearly all for Cleveland owners. None of the big organizations—Carnegie, Rockefeller or the steel combinations—are represented in the list. It will be noted also that they are not of the 7,000 or 8,000-ton type, but of the medium class, as the so-called individual owners who are building them hope to operate this smaller class of vessel to better advantage than they could operate the very large carriers. Vice-President Ireland, of the consolidated ship yards, says that according to present plans the work of building the new fleet will be divided as follows: At Chicago, four steamers for Charles Counselman and others and one for C. W. Elphicke; at Detroit, two steamers for J. C. Gilchrist and one for D. C. Whitney; at the Globe yard, Cleveland, two steamers for John Mitchell and one for Chas. L. Hutchinson; at Lorain, four steamers for J. C. Gilchrist; at West Superior, two steamers for D. R. Hanna; at West Bay City, two barges for D. R. Hanna. This gives to all the yards about all they can do until the opening of navigation next year, but the distribution of the work may be altogether changed, as it is known that Capt. J. S. Dunham of Chicago has all arrangements made to let a contract for a steamer, and an order for four tow barges is expected from Francis H. Clergue, who is conducting large water power enterprises at Sault Ste. Marie. The Pere Marquette Railway Co. also wants a car ferry, similar to the large one which they are operating on Lake Michigan. The W. H. Williams Transportation Co. of South Haven, Mich., has taken up negotiations for a new passenger steamer to run between South Haven and Chicago, but they will probably have to place their order with one of the yards that are not in the consolidation if they want delivery early next spring.

As yet there is no announcement of new orders from the Craig Ship Building Co. of Toledo or the Union Dry Dock Co. of Buffalo, which are operating independent of the consolidation, but from the present outlook they will undoubtedly be provided with all the new work they can care for. The Jenks Ship Building Co. of Port Huron, which is also an independent concern, will launch today (Thursday) the steamer Capt. Thomas Wilson, a freighter of 6,000 gross tons capacity which they are building for the Wilson Transit Co. of Cleveland. They will put down immediately a steamer of Canadian canal dimensions, which is to be fitted for salt water service. A large part of the material for this vessel is already in the Port Huron yard.

Messrs. Robert Wallace and James Wallace, who are among leaders in the management of affairs of the American Ship Building Co., will arrive in New York Friday or Saturday after an extended European tour.

Sixteen steel vessels under order in lake ship yards are to be classed in the Great Lakes Register of Cleveland.

NEW SHIPS OF 5,000,000 TONS CAPACITY.

Last year (1899) the movement of iron ore on the great lakes aggregated 18,000,000 gross tons. Next year (1901) the capacity of the lake fleet, due to new construction, will be just 5,000,000 tons greater than it was in 1899. In other words the lake fleet of next year will be capable of moving 23,000,000 tons of ore if the shipments of grain, coal and other commodities should be limited to about the totals of last year. This statement of new capacity is made from a conservative summary. It includes, of course, the new vessels that came out late last fall, together with the large new fleet of the present season and the ships now under order for delivery next spring. It is an amazing array of increased carrying capacity and the question is again asked: What will be done with all the new ships? How are they to find remunerative employment next year, especially in view of the large Rockefeller fleet that has been held in idleness during the present season? Some of the vessel men who have been in the business through good and bad times have a ready answer. "Within the forty years that I have been interested in vessels," said one of them, "I have heard that question asked at least eight times. On some occasions the conditions were about as they are now; at other times they were worse, as the proportion of vessels in idleness compared with the smaller volume of business then conducted on the lakes was greater than at present, but the ship yards went on with the work just the same. Better times came and the men who had the vessels to take advantage of high freights profited in the end. They were often compelled to wait for a return on their investment but they had the best kind of vessels to offer when ship capacity was wanted. Probably this is the basis upon which some of them are now figuring, rather than the immediate prospects of another year."

Referring to the retirement of Sir William White, chief constructor of the British navy, the United Service Gazette of London says: "During his tenure of office Sir William has designed some 250 warships, representing a sum of $100,000,000, and the construction of the seventy vessels built under the naval defence act in about five years may be regarded as a ship building feat wholly without parallel. The general regret at the loss of this valuable public servant while still in the prime of life (for Sir William was born in 1845) will be accentuated by the fact that the premature retirement of the chief constructor must be ascribed to failing health; for some time past it has been feared that his strength would not continue much longer adequate to the onerous duties of his post."

A dispatch from Newcastle, England, says that agents of the French government are making inquiries in the northeastern British port for steamers available for carrying 1,000,000 tons of coal from Norfolk, Va., to France within the next fifteen months. Three steamers have already been chartered to carry coal from Norfolk to Marseilles. They are the British steamers Raithmoor, 1,500 tons; Reynolds, 2,083 tons, and the Trevanion, 1,566 tons.

The electric steering gear manufactured by the Electro-Dynamic Co. of Philadelphia has proven very successful on the Russian cruiser Variag built by the Wm. Cramp & Sons Co. The Russian battleship Retvizan, also building at the Cramp works, will be fitted with this gear, and the Russian government has ordered three gears to be shipped to Russia to install in new Russian-built war vessels. One of the new American-built International liners will also be equipped with the new gear.

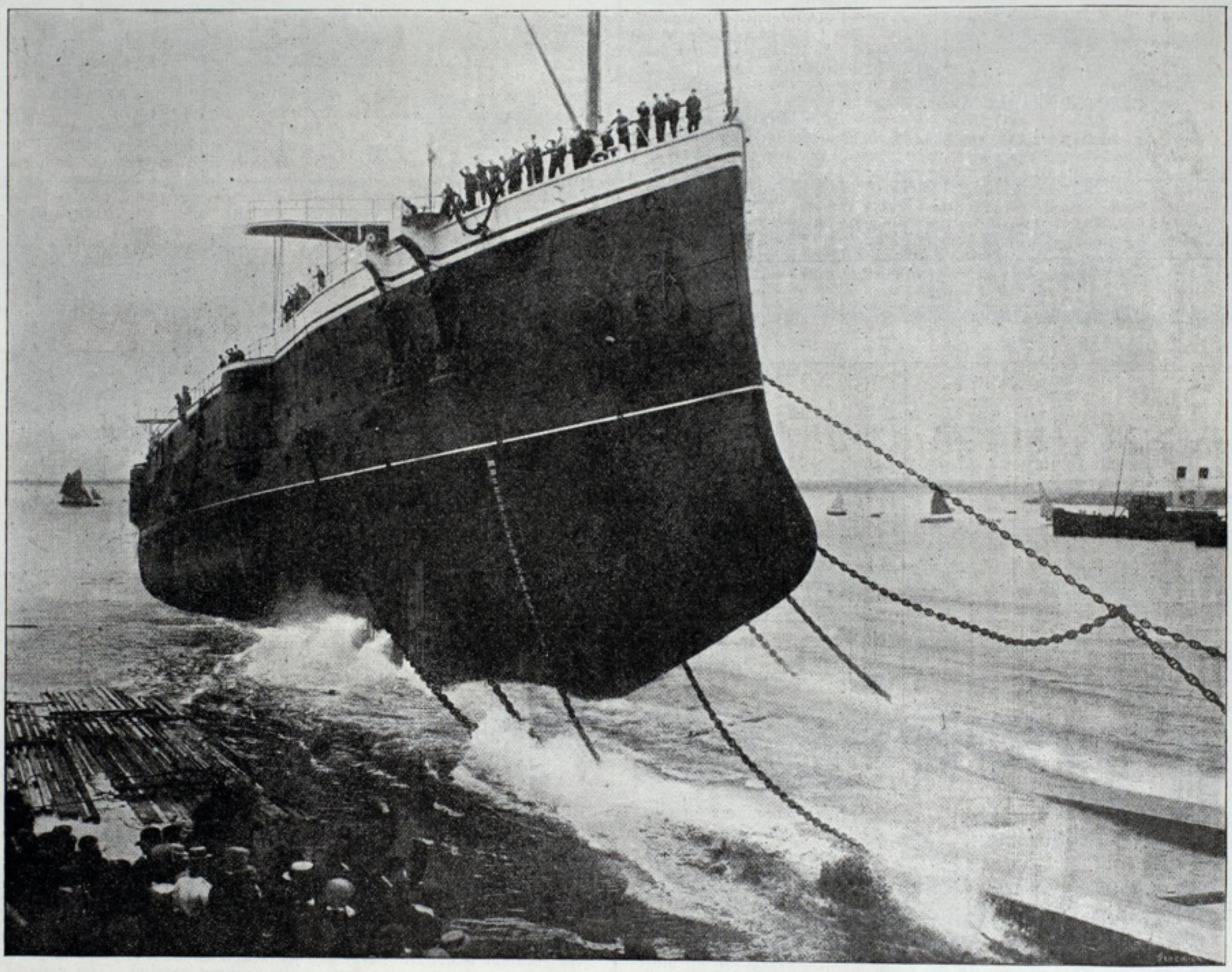
During his visit to the King of Denmark the czar will go to Copenhagen for the purpose of being present at the launching of the new Russian cruiser Boyarin, which is just completed at the Burneister wharf. The Boyarin's length is 413 ft. 4 in., its beam 52 ft. 5 in. and its draught 20 ft. 8 in. Its speed is expected to be 23 knots and it is armed with twelve 6-in. and twelve 3-in. guns.

Particulars of Nineteen Steel Cargo Vessels (seventeen steamers and two barges) under order with the American Ship Building Co., for delivery about May 1, 1901.

Type of vessel.	Dimensions. Over all.	Beam moulded.	Depth moulded.	Approximate value.	Estimated capacity. Gross tons, 18 feet draught.	Engines.	Boilers.	Estimated horse power.	To be built at	To be built for
Steel cargo steamer.	436	50	28	$275,000	6000	Triple exp., 23"-37½"-63"x42"	3 Scotch, 12½'x12'	1800	Cleveland	John Mitchell and others, Cleveland.
Steel cargo steamer.	436	50	28	275,000	6000	Triple exp., 23"-37½"-63"x42"	3 Scotch, 12½'x12'	1800	Cleveland	John Mitchell and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Cleveland	C. L. Hutchinson and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Lorain	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Lorain	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Lorain	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Lorain	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	420	50	2[illegible]	240,000	5500	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Detroit	D. C. Whitney and others, Detroit.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Detroit	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	366	48	28	210,000	5000	Triple exp., 22"-35"-58"x42"	2 Scotch, 13'-2"x11½'	1500	Detroit	J. C. Gilchrist and others, Cleveland.
Steel cargo steamer.	256	42	26¼	200,000	2900	Triple exp., 20"-33"-54"x40"	2 Scotch, 12'-9"x11½'	1200	Chicago	Chas. Counselman and others, Chicago.
Steel cargo steamer.	256	42	26¼	200,000	2900	Triple exp., 20"-33"-54"x40"	2 Scotch, 12'-9"x11½'	1[illegible]00	Chicago	Chas. Counselman and others, Chicago.
Steel cargo steamer.	256	42	26½	200,000	2900	Triple exp., 20"-33"-54"x40"	2 Scotch, 12'-9"x11½'	1200	Chicago	Chas. Counselman and others, Chicago.
Steel cargo steamer.	256	42	26½	200,000	2900	Triple exp., 20"-33"-54"x40"	2 Scotch, 12'-9"x11½'	1200	Chicago	Chas. Counselman and others, Chicago.
Steel cargo steamer.	450	50	28½	275,000	6800	Triple exp., 25"-40"-68"x42"	3 Scotch, 13'x13'	2200	Chicago	C. W. Elphicke and others, Chicago.
Steel cargo steamer.	336	42	26½	180,000	4000	Triple exp., 20"-33"-54"x40"	2 Scotch, 13'-2"x11½'	1200	West Superior	D. R. Hanna and others, Cleveland.
Steel cargo steamer.	336	42	26½	180,000	4000	Triple exp., 20"-33"-54"x40"	2 Scotch, 13'-2"x11½'	1200	West Superior	D. R. Hanna and others, Cleveland.
Steel barge	311	42	24	120,000	4000	Donkey boiler and pumps		......	West Bay City	D. R. Hanna and others, Cleveland.
Steel barge	311	42	24	120,000	4000	Donkey boiler and pumps		......	West Bay City	D. R. Hanna and others, Cleveland.

BRITISH ARMORED CRUISER HOGUE.

The British armored cruiser Hogue, launched from the ship yard of Messrs. Vickers, Sons & Maxim, Ltd., on Aug. 13, is a warship of the Cressy type, and is one of the first armored cruisers built since the Australia class was ordered over ten years ago. She constitutes an entirely new type of fighting ship. In many respects she resembles the Powerful with the addition of an armored belt of considerable area. The displacement is 12,000 tons. The hull is sheathed with teak and coppered. The armament comprises 9.2-in. (22-ton) guns, each mounted in armored barbettes, the mountings being a special design of the Vickers company, by which the guns can be loaded at any angle of elevation for training. These 9.2-in. guns fire a 380-lb. projectile with a muzzle energy of 14,520 foot tons. There are also eight 6-in. guns, with a great range of fire, and there are distributed throughout the ship twelve 12-pounder quick-firing guns and a number of machine guns. The four boiler compartments of the Hogue take up 130 ft. of the length of the ship, the coal bunkers being arranged on either side of the boiler rooms and over the protective deck, and an ammunition passage is situated immediately under the protective deck. There is also an athwartship bunker right forward. Thirty boilers are carried, all of the Belleville type. The boilers have been designed with the most liberal steam generating surfaces, so that no difficulty should be experienced in obtaining the full power, and even more, if of any utility; and at the same time a higher power is obtained per ton of machinery than could be realized with ordinary boilers. At full power the engines will make 120 revolutions, which is estimated to drive the ship at 21 knots.



LAUNCH OF H. M. ARMORED CRUISER HOGUE AT BARROW-IN-FURNESS. CONSTRUCTED AND ENGINED BY VICKERS, SONS & MAXIM, LTD., BARROW-IN-FURNESS.

A new battleship, just laid down at the Baltic yard, St. Petersburg, for the Russian government, is to be named the Kniaz Suvoroff, after the great general of that name. She will be of the Borodino class, to which the Orel and Imperator Alexander III., now building, belong, and will displace 13,600 tons. She will be protected by a complete water belt line of 12-in. maximum thickness, and her armament will consist of four 12-in. breech-loaders, twelve 6-in. and twenty 3-in. quick-firers, besides smaller machine guns. Her two engines, with boilers of the Belleville type, will develop 16,300 H. P. The battleship Kniaz Potemkine Tavrichesky of 12,480 tons will be launched this autumn, so also will one of the three sea-going torpedo boats building in France.

The Neafie & Levy Ship & Engine Building Co. of Philadelphia is arranging for additional ground for the building of vessels, especially the new cruiser Denver.

BARRY, BAINBRIDGE AND CHAUNCEY.

Three of the fastest boats in Uncle Sam's new navy are being made ready rapidly for their maiden plunge in the Delaware. They are the three torpedo boat destroyers on the ways at Neafie & Levy's ship yard, Philadelphia. When they are launched they will be named Barry, Bainbridge and Chauncey. At present they are known simply as 918, 919 and 920. These boats are in many respects the most interesting of their kind ever built for the American navy. Their builders have guaranteed 29 knots an hour on the government trial. To get this speed the three torpedo boat destroyers will be equipped with engines and boilers of 8500 H. P., large enough for a sea-going vessel of 4000 tons displacement. By comparison these little boats are of only 420 tons, long and sharp as a knife, with almost the entire space in them absorbed by the motive machinery. This comprises four boilers, fitted with forced draft, and two balanced four-cylinder, triple expansion engines, each driving one of the twin screws at the rate of 327 revolutions a minute. The boats have steel hulls, 240 ft. long and 23 ft. beam. The plates are of the highest grade steel, the forgings being made at the Midvale steel works. Each of the boilers has 1732 tubes, giving the water circulating through them a heating surface of about two miles in extended area. The boats, besides being of very sharp model, have some novel features of construction. The twin screws are beneath the hull and back of them the bottom plates and frame are hollowed out like an arched ceiling, giving the propellers a compact mass of water to turn in. The stern plates are like an inverted bucket. The model is copied from the latest English type of torpedo destroying craft. They have also the latest adopted device of gun cuts, instead of sponsons. The firing machinery will all be operated from the decks.

"I am satisfied," said a Cleveland vessel owner, referring to recent accidents in the St. Mary's river, "that we would have less trouble in that river and in other shallow channels too if some of us had the courage to publicly denounce the vessel owner or vessel master who insists upon his big ship being loaded down to 18½ ft. when less than 18 ft. should be the limit. The great majority of owners who try to do what is about right in this matter of loading are placed at a great disadvantage by the few who will take chances on big loads at any cost. If government officials are to regulate the movement of ships in the St. Mary's river then let us go a step further and ask them to put a stop to ships coming down with more cargo than they can safely carry through these channels. This is a matter that must be taken up sooner or later and it should be settled at the next meeting of the Lake Carriers' Association."

LARGE FREIGHTER FOR AMERICAN SERVICE.

A very large cargo steamer, the Canadian, designed also to carry a limited number of passengers, will soon enter the American service of Frederick Leyland & Co. of Liverpool. The vessel was launched recently at works of Hawthorne, Leslie & Co. in England. She is 550 ft. by 59½ ft. by 47 ft., and includes all the latest ideas and improvements. The Canadian will carry 11,000 tons deadweight, and she has in her upper works, where they are completely sheltered from the weather, stalls for about 820 live cattle and horses, with the necessary accommodation for their attendants. She has also accommodation for 110 first-class passengers in an extensive upper bridge, containing a handsome dining saloon, which is again surmounted by music, ladies' rooms, smoke room, etc. This upper bridge forms a magnificent promenade, the forward end of which is enclosed in such a way as to afford shelter to the passengers in heavy weather, and the after part is covered by a shade deck. The engineers and officers of the vessel are berthed on shelter deck at each side of engine and boiler casing. The crew, firemen, greasers and petty officers are berthed in the forecastle. A considerable portion of the 'tween decks will be insulated, and the necessary refrigerating plants fitted to enable large consignments of meat and dairy produce to be dealt with. The cargo hatches and their equipment are specially adapted to afford the greatest facilities for loading and discharging. In addition to the usual double bottom large tanks are fitted forward and abaft of the machinery space, which gives a total ballasting capacity of 4,000 tons.

HARBOR OF REFUGE ON LAKE SUPERIOR.

An illustration on this page represents Grand Marais harbor of refuge, Minnesota, and shows the entire harbor. The photograph was taken with a camera that gives a sweep of 180 degrees and includes everything from the little settlement at the entrance to the Indian village at the back.

Grand Marais is an elliptical bay of remarkably perfect curve, with its major axis ½ mile in length and its minor ¼ mile. Harbor work directed by the United States engineer of the Duluth district has been under way there since 1880, and the present contract with the Butler-Ryan Co. for a 350-ft. crib breakwater extending from the west shore toward the light-house will complete the original project. Originally the bay had a maximum depth of 14 ft. and an average depth of 8 ft. Its entrance was 1,000 ft. wide. It was the only spot for 170 miles where a harbor of refuge could economically be made. Nearly $200,000 will have been spent when the present breakwater contract is completed this fall. There is an area of 26 acres dredged to 16 ft., and the entrance is already narrowed by one 350 ft. pier and will soon be by a second, leaving an entrance of 400 ft. It is proposed to dredge the entire harbor area of 60 acres to 16 ft.

Grand Marais has practically no commerce. It is supposed that mineral deposits of value are near it and that ultimately it will become a shipping port.

RECONSTRUCTION OF THE PARIS.

Mr. E. Platt Stratton of the American bureau of shipping, who went abroad recently to approve of the plans for the reconstruction of the American line steamship Paris, to be hereafter known as the Philadelphia, which is now in the hands of ship builders Harland & Wolff, Belfast, Ireland, states that work on that vessel is progressing finely, and that when completed she will be one of the best boats in the transatlantic express steamer trade. She is receiving an entire new bottom and will have new engines and new boilers. Her power will be greater than before her stranding, and she is expected to eclipse in all ways her former records. She will carry but two funnels, instead of three, but otherwise her exterior appearance will be practically the same. The engines will be of the quadruple expansion type, with cylinders as follows: High pressure, 38½ in.; first intermediate, 54 in.; second intermediate, 76 in.; and low pressure, 106 in.; common stroke, 5 ft. The maximum working pressure from the boilers will be 206 lbs., at which pressure the average number of revolutions will be 90 per minute. There will be six double-ended and four single-ended return tubular boilers, all 15 ft. 8 in. in diameter, the double ended being 19 ft. 6 in. long and the single ended 10 ft. 6 in. long. Collectively they will have 1,129 square ft. of grate and 39,618 square ft. of heating surface. The bottom of the ship is to be all new, including new keelson, new keel, new tank top and new flooring. The stern, under water, is to be rebuilt, so that the shafts of the twin screws will be encased within the hull instead of being hung on struts as formerly. The American bureau of shipping, which is classing this vessel, received the order to classify and supervise the construction of all of the new American line steamships now building, amounting to 72,000 tons, which is the largest order ever received by a classification society.

DOGS THAT HANDLE HAWSERS.

I noticed an article in a recent issue of the Army and Navy Register commenting on the British Broad Arrows' plans for the use of dogs in the army, which reminds me of the service rendered by a couple of dogs on the docks of the Goodrich Transportation Co. at Chicago. One of the dogs is a brindle bull called Jack, and the other, a sort of mongrel 'twixt a fox terrier and English bull, is called Spot. Passengers on the Goodrich vessels are much amused by the antics of these animals. Spot appears on the dock every morning about 9:25 alongside the steamer Christopher Columbus. At 9:30 sharp, when Capt. Smith touches the button of the electric bell, the signal to cast off lines, Spot seizes the immense hawser in his jaws, and as soon as the sailors slack up on the boat he jerks it in and throws it off the dock cleat. Sometimes he drags it along the edge of the dock until almost opposite the men aboard the vessel before he lets go, and they can almost pull the hawser on board dry. Spot handles the two after lines every morning, rain or shine, much to the amusement of the passengers watching his efforts.

The most fun, however, is when the Virginia arrives from Milwaukee at 2:45 in the afternoon. Spot seizes the heaving line thrown at him from the vessel and works with it until the hawser reaches the edge of the dock, when he at once grabs it and throws it over the cleats. Then he rushes along the dock for the other line and repeats the performance. Jack is the night dog and is older than Spot, but is badly handicapped by carrying a 38-calibre bullet in his right shoulder. He was shot by the night watchman of adjacent property. While on a rat hunt in the middle of the night he made more noise than usual and awakened the poor night watchman, who immediately shot him. It was thought Jack would die, but by good care he pulled through. The bullet could not be extracted. Jack handles the lines at night and is an excellent watch dog, as he has an imposing, ferocious appearance, but is as gentle as a lamb. He is strong and clever enough to save anyone from drowning who might fall off the dock. Neither dog has had any special training for the work performed, having picked it up themselves when they saw they were encouraged in doing so. I fail to see why the larger and more intelligent dogs are not used oftener at life saving stations, as with the assistance of a buoyant collar they might often be the means of valuable help in case of accident. W. J. W.

CHAIN CASTING MACHINE.

A patent has been granted to an Englishman for a casting apparatus for cables such as are used on board ship as anchor cables, mooring cables and the like; and it has mainly for its object to provide an apparatus by which such cables can be made by casting links of steel one into another. According to the method of manufacturing chain from links and cables the links are made of circular form and subsequently pressed or forged to the desired elliptical shape, with the usual stud or strut fitted in them, and after this they may be annealed or treated to any of the well-known processes to which steel is subjected. The chain or cable is made up of links in which a cast link is cast within another link—say at the end of a piece of completed cable—or within that link and another separately made link. In the latter case, when the cast link is formed, two links are added onto the cable. A link-casting apparatus, when ready to receive the molten metal for the formation of a link, comprises a body or base having covers on the upper side and secured thereto by hinges at their outer ends. A gap extends literally through the base or body and in which the existing link or links rest during the operation of casting fresh links and a space equivalent to the gap is provided between the two inner ends of the covers and through which a part of the existing link or links extend, the molds fitting or resting partly in the body and partly in the cover in chamber or recesses formed by the two. A runner is provided in one of the covers for conveying the molten metal to the mold or lining material which is made up of four semi-cylindrical pieces, two of which when placed end to end form the upper half of the lining or mold, while the other two similarly placed together form the other half of it.

To place the sand molds or lining-segments in the metal box, the covers are thrown up off the base, and the link or links to and through which a new link is to be cast, being placed in position in the gap, the mold segments are placed properly in position in the chambers or recesses. Then the covers are moved down over the molds or lining, and the whole apparatus is then ready to receive a charge of molten steel. In this condition the mold will thus bridge or span the gap and lie within the link or links, as the case may be, to which the new link is to be added.

At a recent meeting of the construction board of the navy department it was decided that the electrical equipment of the four Holland submarine torpedo boats will be required to conform to the standards of the bureau of equipment. An order was issued by Acting Secretary Hackett to this effect, and after the conditions laid down have been complied with by the Holland company contracts for these four boats will be signed.

NAVIGATION INTERESTS OF NATIONS.

BY LYNDON W. BATES.*

This reunion in Paris of the votaries of the science of navigation comes at the auspicious time when from all the world have gathered representatives to consecrate and relegate to history a finished century. Now must the century be sifted and weighed; now must it proclaim what, out of its travail, its experience and its endeavor, it has evolved; and what, as supreme legacies, it transmits to its successor. Of its record there will be nothing which in importance, in national potency and in promise, shall precede its story of navigation. Indeed this pæan of the sea might not over boldly claim to be its central theme, to which all other phases of recital are but related, for there has been no science and no art, no industry and no invention, no dearth and no excess, no demand and no supply, to which navigation has not brought tribute—from which she has not exacted tribute.

The first fact that impresses one at this end of the century is that throughout Europe and America there has come a fresh, mighty impulse of expansion. Colonization, largely latent in the earlier decades, has taken a new force. From South Africa to the Philippines all the waste places are being occupied, and all available territory is being struggled for and appropriated. The invention of modern machinery in the hands of steadily growing capital has increased in the west myriad fold the capacities for production, and the latest great movement is the fruit of it—the effort to enlarge the market. The American continent has during the century opened an enormously greater consumption of European products. The European continent has reciprocally expanded to America's exports. The growth goes on compounding. In addition both have now suddenly united in a resolute, impetuous movement upon the east—the sealed treasure house which they have set themselves to industrially and commercially conquer. We stand in an epoch age. We are witnessing the beginning of a movement laden with an influence greater far than the Crusades, whose vastness outsweeps the reach of an Alexander or a Cæsar, whose dominion dwarfs the imperial vision of a Napoleon. The nations of the west, standing in a portal of the twentieth century, have entered on the battle of the Gods, and the stake is a peopled continent. What the struggle means, what Titan effort and competition will ensue, what the rewards will become—these are almost beyond the dream of the prophet. In one statement alone I would dimly foreshadow them. Of all the world countries America today stands first in its internal commerce. But its internal growth is the tale of a few decades; it has scarcely begun its career. But already through the Sault Ste. Marie canal, between Lakes Huron and Superior, there pass annually two and a half times as many millions of tons as pass through the Suez canal. The American freight is supplied by but a few million people seeking this one of many available routes. Now, to the east alone of the Suez passageway are 800,000,000 of people. What industries, what consumption, what exchange, what commerce, even in full recognition of the Orient's limited want, lie at potentialities in that statement—eight hundred millions of people! Our speech can find no words to at all convey it. There exist the vast east and populations; there lies that destiny highway, Suez; and here to the west, eager, adventurous, are the young Jason nations, sailing out on the golden quest. What is their equipment, what is their strength, who will reach the goal, who will possess the fleece? The master who had trained him—the dying Centaur—alone could predict for each argonaut his destiny; and so here, the master who trained—the dying century—must tell with what equipment each later argonaut sets out for the guarded treasure. Let us hear by what principles they shall be measured.

The nation that would conquer a great future must anticipate the needs and demands of that future, and be ready for them. To be equal to immediate pressures alone is to be relatively retrograde; it is to gamble on seizing and securing fortune by sudden heroic measures of relief. The countries whose interior waterways, rail routes, terminals and harbors are not ready to accommodate increase cannot draw increase, for here also must the law prevail—to him that hath shall be given. Expansion grows; it gains volume and momentum; it cannot be gathered back. This expansion is not alone internal in separated countries; it is supremely international and intercontinental; therefore it is supremely a movement over sea, a movement of navigation.

In this navigation contest the one best equipped shall be he who can most nearly annihilate space and time. That the latest German ships for the China trade are over 600 ft. long and that leviathans of even greater capacity are already laid down in the United States; that multiplying fleets arise to fly the blazing sun flag of awakened Japan—in such things we see how well those people know that the race shall be to the swift and the strong. In the light of this law what can one say who learns that from Gibraltar to Australia there is not a single modern mechanical coal bunker? Vessels must grow in speed, in size, in economy, per ton mile. When the limit is reached with available knowledge then must ingenuity summon other forces and the new supplant the old. Already the invention of a Parsons hints a possible revolution in the internal mechanism of passenger ships, and the development of the gas engine and the steam sulphur dioxide gas motor both promise by their adaptation to nearly double the available equivalent of a pound of coal. In the tension of competition ships must be ever perfecting. They must be more and more skillfully handled; they must be massed in larger and larger numbers. Land transport and water transport must become more identical in interests; must come into more identical hands, and those the hands of commanding capital. The day of the tramp is over. Today the question is not of a ship, but of a fleet; and in the economy of transportation the very first demand is that not a moment of unremunerative time shall count against them; that facilities of ports, terminals, accommodations, shall be such that these flying shuttles shall never unprofitably pause. It is surely fitting that all, whether in vocation high or humble, whether in capacity great or small, shall feel the privilege of being part of this world movement, and shall give of their highest for its supreme advance.

*A paper read at the recent International Congress of Navigation in Paris. Mr. Lyndon W. Bates of Chicago, who has designed and built high-powered hydraulic dredging plants for the United States, Russia and other governments, is known to hydraulic engineers all over the world.

MEANING OF DOMINION OF THE SEA.

In a general way everything which involves the interests of large bodies of citizens is of national concern, but navigation is a national matter in a much closer sense. Laws regulating its every function and phase are made by governments, and its international relations are regulated by conventions to which all countries must adhere. In studying national interest in navigation one is impressed with how little recognition has been made by many countries of their duty to shipping and how this industry neglected, transferred to other hands, has become an agent against the land that has transferred it. What has made England the power she has become? Chiefest, the world's carrying trade. When the items are summed up, of interest, dividends, insurance, premiums, banking and merchants' profits alone, it will be found that there becomes a surprising total of profit to be remitted abroad. It is every nation's duty first to reserve to its own citizens the monopoly of its interior and coast trade. It is its duty, second, to carry in its own ships one-half of what it exports and one-half of what it imports. It should be its aim, third, to secure its just proportion of the carrying trade of such nations as cannot or will not become maritime. A partial monopoly of navigation, with its engrossment of commerce, impels conditions of trade and of exchange favorable to the monopolist, but adverse to the recipient. The "open door" is unquestionably the best system for foreign shipping to demand of China, but for China itself a deeper wisdom would lie in emulating the navigation policy of Japan. The upbuilding and equilibrium of states, commercial stability and naval peace are all involved in these navigation principles. So thoroughly is now understood the meaning of the dominion of the sea that all the progressive nations are in the throes of determined endeavor to wrest what they may of her dominance. The effort to spread markets and upbuild commerce has led in its latest phase to the multiplication of treaties with "favored nation" clauses and special bounties instead of the old discriminating duty system.

The same result could be achieved, the writer believes, with the additional beneficence of building up a merchant marine, under another system, which can be here only outlined. Were each nation to undertake a free insurance of such ships engaged in the foreign trade as were built, owned and manned by her own citizens, together with their cargoes, such insurance would inevitably create preference of employment for the home bottoms, and its benefits would be felt not alone by the owners and operators, but by the producers. The insurance feature could be safeguarded by limitation to a specified amount, to vessels of a certain type, etc., and there must follow all the advantages which lie in a nation's doing its own full share of navigation work. In the United States there exists now governmental inspection of all vessels. The additional task of classification of ships and cargo for insurance purposes would not be serious. The question of naval power is one too vast to be even touched upon. The future of the ironclad seems to the writer less predicable than that of the merchant ship. Its fate lies more in the hands of the inventor. A new gun, with a shell velocity of 4,000 to 5,000 ft. per second, will relegate navies as now built to the cairn of the Vikings.

TECHNICAL ASPECT OF THE SUBJECT.

In the foregoing has been noted the world quality of the latest navigation movement and the relation to it commercially of each nation. This commercial relation rests back inevitably upon the technical. What the ship itself shall be—its strength, its speed, its serviceability—these lie fundamentally with the technician; even further with the very specialized technician. But here, conversely, is the parodox true, that the man who is alone a specialized technician is perhaps the one least fitted for solving his own problems. It is the man large enough, universal enough to be master of his subject, not solely in its narrow limit but in its very broadest, in its every connection and relation, who is really fitted to know and to solve. The electrician who understands electricity alone is not an equipped and cannot make a large electrician. The engineer who is not able to devise the supply for a discovered need is a limited engineer. Vice versa, the inventor who is not also engineer cannot satisfy all around the fateful demands of his calling. The marine architect finds his creation's path blocked by sands, clay or rock. He can fit his ship to earn its returns only within navigation limits. These he should be fitted to expand, if he is to be the best friend to his own ship.

Evolution in merchant and naval types has reached a status where each need, interior, coastwise or ocean going, sets a line to its own form. Witness the oil barge system of the Volga, the ore carrying fleet of the American lakes, the rubber gathering craft of the Congo, and the vessels which the toiling, half-human Chinese trackers drag up the rapids of the Yang-Tse gorges. The very fish are now gathered wholesale by huge steam trawler fleets, which within a decade have supplanted the old time craft. There are places unnumbered where water transport may be advanced when technical skill shall have specialized the thing rightly available for their conditions. On the other hand, in great industries, the tendency is pronouncedly towards standardization—not the standardization of a common type to carry wheat, oil and cattle alike, but of a prescribed type for a common trade. Nowhere is this tendency more marked than on the American great lakes.

When one realizes that in the last century almost every notable stride has been the product of an invention, and that today in every department the captains of industry must be alert to seize or to guard against some supplanting process; when into the calculation of every enterprise enters the factor of an individual—the inventor—an individual unknown, incalculable, liable at any moment to become the arbiter of that enterprise's future—I say, in view of what the inventor has become to modern civilization, it is incomprehensible that invention is not systematically promoted, instead of being left in its present isolated, desultory working.

There are a thousand lines along which the world has grown old enough to advance with premeditation, not at haphazard.

In considering the ship, one must study the channel she is to traverse and the harbors from which she goes and to which she comes as haven. In connection with water courses and the desire to improve them, one is impressed with how inadequately sometimes local authorities study what they really possess to make the most of it. The beginning of improvement is to perfect to the uttermost what nature has allowed. The right lighting, buoying and ranging of channels could certainly be secured and an accurate and complete hydrography. The day of intuitive pilotage should be past, and those charged with lives and values should have the guidance of exact knowledge. One cannot overpraise the Russian governmental system for educating the pilots of the Volga, and for recording and publishing the daily variations of the river's barring sands. The navigators of the erratic Hoogli are similarly safeguarded. And here one would fain pay some tribute to the glorious, romantic, but mostly unknown and unrewarded record of the long line of mappers and observers of the earth's waterways. What many of these masters did with poor tools and ill-provisioned boats on unknown dangerous and hostile coasts, in arctic cold and torrid heat, enhances our reverence for human courage and human thought. The lives of a La Perouse, a Cook, a Flinders, a Mercator and a Maury, reflect the same qualities that are immortalized in a Cabot, a Magellan and a Columbus. As a fruitage of the universe of precedent labors we latest workers have those marvelous admiralty charts of the maritime nations sold for a veritable song.

HOW FAR GOVERNMENTS SHOULD EXECUTE AND CONTROL PUBLIC WORKS.

In considering the improvement of waterways and the creation of perfect terminal facilities there is a fertile question for a congress like this to determine—how far governments should themselves execute and control public works, and how far they should instead foster their execution by private capital. In many of these older countries the sentiment is strong that the central authority must hold and itself undertake all national improvements. In America heretofore a mixed policy has seemed rather to prevail. In the last quarter of a century there the development of harbors and waterways has been enormous. The government has been naturally the central agent. Since 1873 it has appropriated to this end over $400,000,000. It has now in contemplation an additional $150,000,000 for an Isthmian canal. The expenditure of these $400,000,000 has during the interval exerted a vast influence directly upon the industrial and commercial prosperity of the people. But indirectly it has drawn into co-operation private capital representing a much greater total than the government expenditure. Individual and corporate projects for dock, freight handling appliances for terminal facilities, for the extension of railways, for the location and development of town sites and back country, represent investments compounding enormously the original stimulus of the government initiative.

Another pregnant question would be how far it were the part of national wisdom and statesmanship to execute great projects, themselves not dividend paying, yet vastly valuable to the prosperity of the people. Such works as the Assouan dam, the Sault Ste. Marie and the Manchester canals are instances in point. Such might (but might not) be the improvements through which Russia would enable the largest sea-going ships to go straight to all railway termini on the Black sea, instead of trusting her national trade to small cargo units handicapped by lighterage to off-shore anchorages. In all these departments, in every phase of human activity, the movement is inexorably forward and for its advance it depends quite as inexorably upon the advance of technical skill. That is chiefly why in these congresses, and supremely in this congress of navigation, we come together to consult. We would note wherein the valuable tried and proven old things, old forms and old methods are still proving adequate to enlarged needs. We would also discern where they are failing and must be supplanted. In such cases we must take counsel together as to what are really the new conditions and the new demands; we must tell what each, in his own sphere, is doing in endeavor to meet those demands, and we must give the inspiration, advice and encouragement which will elicit from each his highest. We revere the past, the immortal century, which Paris sets an exposition to crown. But the dead of the century have laid down their work and to continue and increase it rests with us, the living. As we fall or as we rise, so must the new century fall or rise. Its destiny lies in us, the living, and its highest water mark shall be set in this generation by our achievements. That, therefore, we shall know each other's honest endeavor, that so far as in us lies we shall speed the promise to the fulfillment, seems the very worthiest mission of a navigation congress.

Following this very interesting general survey of the newer conditions and newer needs from the standpoint of navigation interests Mr. Bates referred to the advancement that has been made in his own special line, that of high-powered hydraulic dredges and their application to public works. He has been carrying on some very large undertakings of this kind of late in Russia. Hydraulic dredges which he has designed and constructed within the past few years are the largest in the work. They have been illustrated and described in the columns of the Review. A paper contributed by Mr. Bates to the last congress dealt with these machines. The balance of his present paper was of a supplemental kind, dealing with dredging plants for Russia, India, Australia, China and other countries.

Before many years have passed, all the modern steamship's auxiliaries will be electric-driven. Even the most conservative naval architect must admit that electric winches, ventilating blowers and steering gear are proving successful. Why would not electric windlasses, ice machinery, etc., do equally as well? In Great Britain motors are being fitted extensively to operate circulating pumps and engine-room auxiliaries. It is more than probable that within four or five years vessels will be built with complete electric-driven auxiliaries, the quarters also being fitted with electric heaters.

The new naval coaling station at Groton, opposite New London, Conn., has been thoroughly tested quite recently, the Texas, Dahlgren, Craven, Gwin, Morris, and Rodgers having received a large supply of coal during the past two weeks.

WORLD'S SHIPPING.

VALUABLE INFORMATION FROM A NEW EDITION OF LLOYD'S REGISTER REGARDING THE MERCHANT MARINE OF ALL NATIONS.

A new edition of Lloyd's Register (British), just issued, gives the usual mass of valuable statistics relating to the mercantile marine of the world. About forty nations possess trading ships of one kind or another, and as the supply increases year by year the total is gradually assuming colossal dimensions. In the middle of 1899 the vessels numbered 28,180, representing a tonnage of 27,673,528; now the respective figures are 28,422 and 29,043,728. Close on 50 per cent. of this enormous tonnage is owned by Great Britain and her colonies. If the numerical proportion of British ships is not so great it is because the majority of them are of a larger size than those of other nations, and because more of them are propelled by steam. British sailing ship tonnage is diminishing so rapidly that it has sunk to some 2,000,000—or a third of the whole throughout the world. The steamer tonnage, on the other hand, has expanded to upward of 12,000,000, leaving only some 10,000,000 to all the other nations. The result is that the bare statement that, while the British empire has 10,838 vessels, the rest of the world has 17,584 is quite misleading so far as carrying efficiency is concerned.

One ton of steam tonnage is equal to three tons of sailing ship tonnage, and in steam tonnage the British merchant navy is superior to those of all other countries combined. It is not, then, by the mere number of ships that the actual strength of mercantile navies must be judged. Some twenty years ago the comparatively small total tonnage of 6,000,000 credited to Great Britain was divided among 20,000 vessels, but more than half were sailing craft. Bit by bit the ships propelled by the "unbought wind;" and, therefore, at the mercy of the elements, have been replaced by steamers of large capacity which can conduct their trade under all conditions of weather. Nearly a half of the tonnage of the United States is made up of sailing vessels. Norway and Italy have nearly as many sailing ships as steamers. The Portuguese stand very much in the same position, and even the French, Germans and Russians have a fairly large proportion of sailing ship tonnage. The following table shows the vessels and tonnages of all the nations that own more than 100,000 tons:

Country.	Vessels.	Tonnage.
British Empire	10,838	14,261,254
United States	3,135	2,750,271
Germany	1,710	2,650,033
Norway	2,380	1,640,812
France	1,214	1,350,562
Italy	1,176	983,655
Russia	1,246	720,901
Spain	597	694,780
Sweden	1,433	637,272
Japan	1,066	574,557
Holland	406	530,277
Denmark	802	519,011
Austro-Hungary	270	416,084
Greece	369	245,094
Brazil	332	163,087
Belgium	117	162,913
Turkey	305	143,490
Portugal	204	111,055
Chile	127	110,978

The remaining countries—Argentina, China, Colombia, Cuba, Hayti, Hawaii, Mexico, Montenegro, Peru, Philippine Islands, Roumania, Sarawak, Siam, Uruguay, Venezuela and Zanzibar—share between them about 300,000 tons of shipping.

At the present moment, according to Lloyd's, Great Britain has more than 1,600 steamers of 3,000 tons and upward. Germany has only 127 vessels of that large class, while the United States has 120 and France sixty. The supply of these steamers in Russia, Japan, Italy and elsewhere is infinitesimal. Another element of interest attaches to vessels that have a tonnage of 10,000 and upward. Just a year ago Germany took the lead in this respect, having twenty against twelve owned in England and four owned in the United States. Germany has added only one leviathan to her fleet during the twelve months, and unfortunately she has just lost two in the terrible fire in New York harbor. The Americans have remained stationary. Great Britain has been expanding to such an extent that her register now contains twenty-four steamers with a register of 10,000 tons each and above. She also retains the honor of possessing in the Oceanic the largest liner in the world. The North German Lloyd Co. is understood to be building a steamer which is to exceed the dimensions of the British one, but along with this comes another report to the effect that the White Star Co. is prepared to go one better still. Before such an enormous development of ocean craft, the old idea that large boats were unprofitable must be regarded as well nigh exploded.

It was declared at one time that satisfactory financial results could be expected only from vessels of moderate speed and capacity, but British ship owners, at all events, seem to have changed their minds on the subject. Out of ships built in 1899 more than 200 of 3,000 tons and upward were added to the British register, while only twenty were added to the German register, three to the French, six to the Italian and none at all to the Russian. The official figures regarding the output of last year are as follows:

Country.	Vessels.	Tonnage.
United Kingdom	655	1,363,012
Germany	98	227,398
United States	154	207,345
France	55	59,933
Italy	24	33,542
Norway	30	24,351
Denmark	21	17,215
Holland and Belgium	26	14,821
Sweden	31	11,052
Japan	9	9,930
Austro-Hungary	7	8,290
Russia	27	4,952

LIGHTS ON LAKE ERIE.

A VERY INTERESTING COMMUNICATION FROM COL. WM. ANDERSON OF OTTAWA RELATIVE TO NEW PLAN OF LIGHTING PELEE PASSAGE.

Editor Marine Review: Since the intention of the Canadian government to build a light-house on the middle ground, Pelee passage, Lake Erie, instead of rebuilding the Dummy light-house, was published, a good deal of criticism of the proposal has reached me from various quarters. Possibly a few words of explanation in your columns may satisfy mariners that the Canadian government has taken the best course possible under the circumstances in choosing the middle ground as the site for the new light-house.

Everybody will acknowledge that the old light-house on the Dummy was not well located to suit the needs of the deep-draught boats now navigating Lake Erie; it was built when vessels of only 12 to 14 ft. draught were used, and for them it was undoubtedly in the best position, but the fact that Grub reef and Southeast shoal lie outside, each with more than 14, but with much less than 20 ft. of water on it, rendered the site unsuitable when vessels of 18 ft. draught came to be used. When we contemplated building a new light-house my proposition was to place it on the middle ground, but before finally determining the site we asked lake mariners to give us their views upon the proposed change. A great many of them warmly recommended the middle ground; many others suggested that Southeast shoal would be a preferable site. If built on Southeast shoal a light-house would undoubtedly guide up the lake from all points, clear of all outlying dangers; but it would not be so well located to guide vessels after passing it or when coming from the westward. On the other hand the light-house on the middle ground is in much the best location for vessels coming from the westward, as there is a clear course from Colchester reef. It is also in the best location for all vessels bound up the lake from Cleveland or any port to the westward of that point, but for ports to the eastward it would suit better if on the Southeast shoal.

Another consideration in determining the position of the light-house is that all vessels downward bound are heavy laden, and a light on the middle ground is absolute security to them. Many vessels upward bound are light, and can pass over the Southeast shoal in safety. Light vessels from Buffalo will be able to shape a course for the middle ground light-house as soon as they pick it up, without having to round the Southeast shoal. The next factors in determining between these two rival sites were the questions of stability and expense. The north end of the middle ground is a flat rock with only 14 ft. of water on it, an ideal foundation for a pier. A pier on the Southeast shoal would have to be sunk in 24 ft. of water on a shifting sand, and would be an extremely expensive structure. Indeed to insure stability on such a bottom very large and expensive works would have to be built all round the pier, and it is doubtful if the Canadian parliament would have granted the very much larger vote necessary to provide a permanent light-house on so insecure a foundation; while the questionable advantage in site would have been dearly purchased at the greatly increased cost and decreased security.

It is proposed to place in the middle ground light-house the strongest modern quick-flashing light, and in all weathers, except the very thickest, this should be picked up far outside of all dangers. By bringing it on a compass bearing there should be no difficulty in clearing the Southeast shoal. I may now summarize what the department proposes doing to improve aids to navigation in this vicinity.

First—To place a quick-flashing light with a first-order fog siren on a permanent pier on the north extremity of the middle ground.

Second—As soon as the pier is sunk, which I hope will be early in October, and a temporary light is exhibited from it, it is proposed to remove the gas buoy from the middle ground to the south point of Grub reef. The temporary light to be shown from the middle ground pier will be an occulting gas light.

Third—To show vessels how close they can run to the light-house it is proposed to place three black spar buoys in 20 ft. of water on the northeast, north and northwest edges of the shoal.

Fourth—The light in the gas buoy on the Southeast shoal will be changed from a fixed light to a flashing light.

Fifth—The lights on the Dummy and on Pelee island will be discontinued as soon as a good light is shown from the middle ground, but probably not before the close of navigation this year.

I would draw the attention of masters to the fact that they can make a better course from Detroit river light-house to the open lake by passing closer to Colchester reef than they now do, and also by passing quite close to the middle ground gas buoy, which is moored in 35 ft. of water.

When the permanent light-house on the middle ground is in operation such an improvement, of course, would save them a couple of miles on the way to Cleveland or Buffalo.

WILLIAM P. ANDERSON, Chief Engineer.

Department of Marine and Fisheries, Ottawa, August 25, 1900.

The Massachusetts will be placed in ordinary in the League Island navy yard as soon as the Alabama goes into commission.

Lake Tour of the Committee on Rivers and Harbors.

Editor Marine Review:—It was my privilege, as the guest of the Lake Carriers' Association, to accompany the rivers and harbors committee of congress on a tour of inspection of the lakes from Buffalo to Duluth and thence to Chicago. As a pupil, in watching a mechanical apparatus showing the revolution of the planets about the sun, acquires more knowledge in a minute's time than he could obtain in a month's study, so has the object lesson presented by this tour of inspection conveyed to the minds of those composing the rivers and harbors committee a more perfect idea of the magnitude of the commerce of the lakes and its relation to the interior products of soils and mines than could be intelligently presented by numerous delegations appearing before them in Washington. It was especially important that six of the southern members of the committee have had an opportunity to become personally familiar with the needs of these great waterways of trade and commerce. They are intelligent men. They are fair men. They are as ready to legislate for the benefit of the commerce of these inland seas as for the rivers and harbors of their own districts when once they become familiar with the necessities of the lake region. I am sure the results will be profitable, not only to the commerce of the lakes but to the trade of the whole country, as anything which tends to facilitate commerce and give cheaper freight rates from the interior to the seaboard is a matter of national concern and not of mere local consideration. Burton, Alexander, Bishop and Davidson represent lake districts. It might be said that they did not need the information which they have recently acquired; but, on the other hand, the magnitude of the work contemplated and its value to our whole people are such that appropriations should not be made except after most intelligent and diligent inquiry. I sometimes think that the work of the rivers and harbors committee is more important than that of any other committee in congress, as it has to do with the improving of the great highways of trade, so important if this country is to take the place in the commerce of the world which destiny has intended for us.

I never met a more conscientious body of investigators; men of higher personal integrity; or men better fitted to grasp the details of the great work the government has to do through the rivers and harbors committee. I am confident that the Lake Carriers' Association has acted wisely in extending its courtesies to this committee. So far as the work of the weather bureau is concerned in its relation to lake commerce, I can freely say that I have acquired a fund of information as to local needs and opportunities for improvement which will enable me to more intelligently act in passing upon matters having to do with the improvement of our storm-warning service. Secretary Wilson directed me, especially, to improve our equipments and the methods of displaying storm warnings wherever it was possible to do so, and to hasten the displacement of old and obsolete signal staffs and marine lanterns with new storm warning towers and electric lights, which were authorized by congress on his recommendation. I shall promptly take such action as will comply with the secretary's wishes.

Chicago, Ill., August 24, 1900.

WILLIS L. MOORE,
Chief U. S. Weather Bureau.

CONTROVERSY OVER THE THREE PROTECTED CRUISERS.

The majority of members of the naval board of construction have replied to the protest of Rear Admiral Hichborn, defining the chief characteristics of the three protected cruisers, which was published in last week's issue of the Review. They do not think his arguments are of weight except the one in which he says he does not believe the ship designed by the circular can be built within the appropriation, and even this argument, they contend, may be satisfactorily met with when the bids are opened. As the matter now stands it is in abeyance; nothing can be done until Secretary Long returns to Washington. The reply of the majority of the board is as follows:

"The objections raised by the chief constructor to the circular may be summarized as follows:

"First.—That because the act of authorization does not contain a specified provision for armor for these vessels none should be used in their construction.

"Second.—That because the vessels as described are to carry armor they are therefore armored cruisers and not protected cruisers.

"With regard to the first objection the board respectfully submits that the language employed in the act of June 7, 1900, relative to the cost of the three protected cruisers now under discussion is precisely the same as has heretofore been used in various acts providing for vessels of all classes, both armored and unarmored. The language referring to cost does not, in the opinion of the board, define in any way the characteristics of the vessels. It designates, however, when considered in connection with the decision of the attorney general, dated Jan. 31, 1889, and referred to the minority report and the department's letter No. 4121-00 of July 12, 1900, to the board of construction with special reference to the vessels now under consideration how such armor as is used shall be considered, that is, whether it shall be regarded as armor or as armament and how it shall be paid for. The same phraseology as to cost as is used in the act of June 7, 1900, with reference to the vessels herein considered, is found in the act of July 19, 1892, authorizing the battleship Iowa; in that of March 2, 1895, authorizing the Kearsarge and Kentucky; in that of June 10, 1896, authorizing three battleships of the Alabama class, and in that of May 4, 1898, authorizing four harbor defense monitors. All these vessels carry armor, and yet the clause relating to cost makes no reference to it. This question, if there be one, has nothing to do with the type of vessel described in the circular, it being rather a question of the interpretation of the law, and therefore a matter for the department to deal with and not the board.

"As regards the terms armored and protected cruisers the board has been more intent upon defining the chief characteristics of a thoroughly useful and efficient vessel than in considering the definition of a term which is used conventionally. Protection may be by means of vertical or horizontal armor, cellulose, coal, or protective deck, or a combination of any or all, according to the ability of the ship to carry it and to the views of the designer, there being no arbitrary rule with respect thereto. It is generally understood that a protected cruiser carries less protection than an armored cruiser, and to show that such is the case in the vessels under construction and that undue prominence has not been given to that element, it is noted that in the proposed new unsheathed battleships of 14,600 tons trial displacement, 3,690 tons are allotted for protection, exclusive of the protective deck, an amount equal to 25.2 per cent. of their trial displacement. In the proposed new unsheathed armored cruisers of 13,400 tons trial displacement, 2,219 tons are allotted for protection, exclusive of the protective deck, an amount equal to 16.5 per cent. of their trial displacement. While in the new unsheathed protected cruisers herein referred to, of 9,542 tons trial displacement, but 821 tons are allotted for protection, exclusive of the protective deck, an amount equal to 8.6 per cent. of their trial displacement, which certainly cannot be regarded as excessive.

"The board does not assume to know what views were held by congress regarding the kind or amount of protection that protected cruisers shall have, but it is fair to assume that it desired real rather than nominal protection, if indeed such details were at all considered. It is thought rather that, with the other numerous details of ship construction, it was intended to be left to the discretion of the department. The board wishes to emphasize the fact that the condition of the Spanish cruisers after the battle of Santiago, and the recent Bellisle experiment in England, indicate the great importance of adequate protection of a vessel's side as far as it can be provided for, and the great increase of late in the efficiency of guns of all calibers renders it still more important. Hence the board has endeavored to provide the best protection practicable for the proposed vessels, without a sacrifice of other important elements, such as speed, battery, coal, good sea-going qualities, habitability, etc., and it believes that the vessels embody these features to a marked degree. It can be shown that the tendency of modern construction is to place vertical armor on the side over gun positions in all cases where the displacement admits. Recent professional literature is very emphatic on this point, and recent foreign construction, classed as protected cruisers, provide for outside vertical armor. It is believed that it would be a serious mistake to build these new cruisers without vertical armor, as is proposed by the chief constructor.

"Another objection given by the chief constructor is that because certain Russian and French vessels are designed for a speed of 23 knots, the United States would be behind other nations by building protected cruisers of less speed. In reply the board begs to state that it prefers something more tangible than the additional one knot of speed recommended by the chief constructor, as the weight and cost of the machinery required for this extra knot can be applied more advantageously in these ships to other purposes. The chief constructor says that the vessels described in the circular are not sheathed and coppered. In reply to this the board begs to state that it did not regard sheathing and coppering as a legitimate subject for consideration, as the department's letter to the board of July 28, 1900, No. 458,800, states that 'the board is advised, in answer to its inquiry made in its letter of the 25th inst., that the circulars defining the chief characteristics of the three armored cruisers and the three protected cruisers, authorized by the act of June 7, 1900, should not call for sheathed and coppered vessels, as the act referred to does not require those features of construction to be embodied in said vessels.'

"Still another objection raised by the chief constructor, that the limit of cost provided by law, namely, $2,800,000 each, precludes the construction of vessels as described in the circular, is in the opinion of the board the only one that merits serious consideration. The board is of the opinion that the appropriation is sufficient to cover the cost of the vessels as described in the circular, and believes that such vessels can be built as cheaply as the sheathed and coppered vessels of 23 knots speed recommended by the chief constructor. The board knows but one way to determine the question, and that is by inviting bids. As regards the type of vessels described in the minority report, the board does not believe that such a one would prove as satisfactory or as efficient as the one described in the circular and would under no circumstances think of recommending that a vessel of 8,500 tons trial displacement, equipped with such powerful means of offense as proposed, should be without any protection to her gun positions or to her sides except a belt of cellulose. As regards the recommendation of the minority report, that sheathed and coppered vessels of about 8,500 tons trial displacement be built, the board respectfully submits that such is in contradiction of the department's interpretation of the act of June 7, 1900, and is contrary to its instruction to the board.

"While the board does not consider the matter contained in paragraph 9 of the minority report, discussing the question of sheathing, as pertinent to the subject at issue, it feels compelled to state that it is misleading, as it conveys the impression that after a thorough investigation of the subject by congress, that body declined to change the law requiring certain vessels to be sheathed and coppered, whereas the facts of the case are that the naval committees of the house of representatives submitted to that body a bill containing a provision that the question of sheathing should be left discretionary with the secretary of the navy. It so happened that this provision in the bill referred to formed part of a paragraph which dealt with the price of armor, which was ruled out on a point of order, said point of order referring only to the price of armor and not to the question of sheathing. In reprinting the bill the provision leaving the matter of sheathing discretionary with the secretary of the navy was left out, so that the matter never reached congress as a body. It will be observed that the minority report finds no fault with the vessel proposed, except that she has too much protection to suit the views of the chief constructor, and perhaps cannot be built within the limits of the appropriation. In case the circular is not satisfactory to the department it is respectfully recommended that it be returned to the board with instructions to modify it to meet the department's views in the matter."

At a meeting of the board on construction on the 27th inst. the following features were agreed to concerning the protected cruisers authorized by the act of June 7, 1900, viz:

Speed on trial, 22 knots.
Trial displacement, 9,542 tons.
Coal on trial, 650 tons.
Bunker capacity, 1,500 tons.
Feed water on trial, 50 tons.
Total feed water, 150 tons.
Water line belt, 200 ft., 4 in. thick, 7 ft. 6 in. wide.
Upper and lower casemate armor, 4 in. thick.
Six-in. gun protection, main deck 4 in. thick.
Conning tower, 5 in. thick, top 3 in., signal tower, 4 in. thick.
Complete cellulose belt.
Complete protective deck, 2 in. on flat and 2½ in. on slopes; slopes laid on ½-in. plate.
Main battery, fourteen 6-in. guns.
Secondary battery, eighteen 14-pounder, 3-in. guns; two 3-pounder, S. A. guns; four 1-pounder automatic guns; eight 1-pounder R. F. guns; two 3-in. field guns; two machine guns, 30 caliber; eight automatic guns, 30 caliber.

The foregoing, according to memorandum of July 25, 1900, will foot up as follows:

	Tons.
Hull and fittings including protective deck and cellulose	5,093.50
Side and transverse armor and 6-in. gun protection on main deck, conning and signal towers	771.40
Steam engineering—22 knots; 21,000 H. P.	1,800.00
Feed water on trial	50.00
Ordnance	516.00
Equipment 140 tons electric plant; 140 tons equipment	280.00
Outfits and stores	218.00
Officers, crew and effects—forty officers, 525 crew	73.60
Coal on trial	650.00
	9,542.50

QUESTION OF SUBSIDIES.

Editor Marine Review: I am pleased to note in your Blue Book of American Shipping the increase in the number of merchant vessels that are being built throughout the country, as well as the construction of vessels for our own navy, with a few for foreign countries. To my mind the beginning already made shows that there is no longer any necessity of subsidies for the purpose of building up an American merchant marine. It will come of its own accord. Especially is this true if we consider the plan of giving subsidies only to the fast ocean-going grey hounds. They carry a very small portion of the world's commerce on the high seas. They can not afford to run on long voyages. They are owned by large corporations who have in most cases grown wealthy without need of a subsidy. These are not the ships to help. But viewing the subject in a broader sense, it must be plain to everyone who is in touch with shipping matters that the time is at hand when we can build the finest ships in the world at a cost equal to that of any other nation.

Sandusky, O., Aug. 22, 1900. S. C. WHEELER.

Simon Lake, the well-known submarine boat inventor, whose Argonaut made a trip of several hundred miles along the Atlantic coast, has identified himself with a new company formed, a few days ago, under New Jersey laws. The company is the Sound & Coast Wrecking Co., and it has a capital stock of $500,000. The new company proposes to enter the submarine wrecking business, and it will have the advantages of all Mr. Lake's numerous devices for submarine operations. Mr. Lake claims that by the use of some of his patents the present methods of supplying divers with air will be superceded. Associated with him in the new enterprise is L. W. Miller of Elizabeth, N. J., and George W. Carey of Stratford, Ct.

MARINE REVIEW

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The question of the small port hole is agitating the European journals considerably. In London lately there have been started two or three papers after the yellow pattern of American journalism and they have taken Rear Admiral Melville's exclamation that the small port holes of the ocean liners are an abomination as their text. The small port hole must go is the ultimatum pronounced. The noise has attracted the attention of the sober technical journals and they accordingly have devoted much space to it. The discussion, of course, comes into being through the awful destruction of life in the fire on the North German Lloyd liners. The subject, however, is not new. Hitherto the small port hole has blocked egress and has caused the taking of lives which otherwise might have been saved. Each time such an event occurs the subject of a larger port hole is agitated. It was so in 1891 when the liner Anglia was thrown on her beam's end in the Hoogly mud. Naval architects and builders took up the subject then and came to the conclusion that the port holes could not be made larger. Port holes are not intended as avenues of escape, but as means whereby light and air may be admitted to the inward parts of a ship. It was decided that they could not be made larger without a sacrifice of structural strength. The British board of trade, which exercises a very close vigilance over the conduct of British shipping, issued a revised edition of their instructions recently in which they say: "Surveyors should remember that while in some places, such as the ends of poops, forecastles and bridge houses, and in the sides or ends of deck houses, the size of scuttles may be as large as convenient; where, however, they go through the side plating the structural strength of the ship may be affected by them and a larger diameter than 10 in. should not in such cases be recommended. In the forward part of the ship it may sometimes be undesirable to have them so large as 10 in." To increase their size is to structurally weaken the vessel and render possible the admission of the sea, which would undoubtedly prove as productive to terrible disaster as fire.

The wonder and the romance of it! There has been at least one American product which has needed no diplomat to open the door of foreign commerce for it. The over-sea oil trade of the United States is a commercial miracle. Its inception was most modest. There was nothing about it to enliven the imagination; and now it has grown to such proportions as to fairly beggar the fancy. It is an important factor in American shipping. In 1862 about 10,000,000 gallons was sent abroad; in 1871 the exports aggregated upwards of 152,000,000 gallons. This period represents the desertion of the grain business in Cleveland by John D. Rockefeller, then a very young man, and his entrance into the business of refining oil. In 1882 the export demand for American oil was 514,000,000 gallons. This period represents the inception and organization by John D. Rockefeller of that combination of interests now known as the Standard Oil Co. In 1897 the exports reached nearly 1,000,000,000 gallons—to be exact 994,297,756 gallons, representing in money $62,000,000. This trade has been built up in spite of Russian competition, and Russia has the most productive oil field in the world. Russia also has a prohibitive tariff of 200 per cent. in its own immense domain. It can keep American oils out of its own empire, but it cannot keep them out of any other part of the globe, civilized or pagan. It is a monument to American ability that the United States can sell its oils at the very door of Russia. It can sell a superior article at a less cost in Central Europe and yet pay the long distance freight and a better wage. That's due to economy of method in refining and transporting. Without the Standard Oil Co. the American oil trade would still be in the dribbles with an inconsiderable export trade.

J. C. Stubbs has begun to run Collis P. Huntington's gauntlet. He will be pretty thoroughly clubbed before he gets through with it. Lately in Chicago he made a speech opposing the construction of the Isthmian canal. Huntington opposed the canal because he thought it would injure his railways. He used to say that for the interest on what the canal would cost he would transport from the Atlantic to the Pacific all the freight that ever went through it. Stubbs thinks that the money which the canal would cost ought to be expended in upbuilding the American merchant marine. The merchant marine needs upbuilding, it is true, but it does not want to be upbuilt at the cost of another and equally important interest. The Isthmian canal is a necessity to the complete development of American trade. The markets of the orient are about to be opened. New York will continue to be for many years the principal outlet for American shipping. It will need the canal to reach the east. Money should be appropriated for the upbuilding of shipping, but it should not be money which is needed for a commercial waterway.

One must reduce figures to the simplest proposition to make the layman understand the real greatness of the British isles in the world's maritime trade. The figures show that considerable over 2,000 vessels a day enter and clear the ports of Great Britain. That is nearly ninety vessels an hour for every hour in the twenty-four hours of the day. This is a stupendous showing and is the very marrow in the bone of England's strength. Following are the tonnage entries of the United Kingdom at various periods:

Year.	Sea-going.	Coasting.	Total.
1801	1,720,000	6,000,000	7,720,000
1810	2,070,000	7,000,000	9,070,000
1820	2,110,000	8,000,000	10,110,000
1830	2,940,000	8,240,000	11,180,000
1840	4,720,000	12,600,000	17,320,000
1850	7,250,000	21,510,000	28,760,000
1860	12,350,000	24,400,000	36,740,000
1870	18,320,000	28,850,000	47,170,000
1880	29,070,000	36,140,000	65,210,000
1888	33,950,000	47,570,000	81,520,000
1898	45,125,334	55,422,029	100,547,373

Diplomats at Washington have finally succeeded in getting around the treaty of 1817 sufficiently to permit the auxiliary gunboat Hawk to be sent to the great lakes as a training ship. The gunboat, which is now at the navy yard at Norfolk, Va., is being handsomely fitted as a practice ship for the Ohio naval reserves. Secretary Hay recently notified Gov. Nash that the Reserves could have her. A crew will be selected by Gov. Nash from the Ohio naval militia to bring the boat to the lakes by way of the St. Lawrence river. The boat will probably be stationed at Cleveland.

A San Francisco dispatch says that application has been made by the Risdon Iron Works for space on the water front, near the Risdon plant, for a great floating dry dock which is intended to be the largest of its kind on the coast and one of the best in the world. The company's plant is being put in shape to turn out ships of the very largest size.

LAKE HULL INSURANCE.

COLLISION LOSSES MAY CUT DOWN PROFITS—DISCUSSION REGARDING EXPERIENCE OF UNDERWRITERS WITH THE BIG STEEL FREIGHTERS.

Buffalo, Aug. 29.—Speaking with some concern regarding losses this season from collision, prompted by the sinking of the steamer Specular, a leading marine underwriter lately took quite an unfavorable view of the situation generally. He said that the losses from this source alone were so much greater than last season, and more than the average, that a few more of the sort would mean a severe reduction in the margin of earnings that is still supposed to stand on the books as regards the hull business. But after all it is of small account that the losses from collision are more than they were last season, for they were phenomenally small then and really had much to do with the good report made of the season's business.

Should there be much more of collision loss, or indeed in any other branch of hull insurance, it is intimated that some figuring will need to be done to find how the balances stand, which is a sufficient indication that nothing of the sort has been done yet and that everybody felt safe up to a comparatively recent date. There is no real expectation, apparently, that there will be a loss on hull insurance this season, though it is now quite likely that it will not be so very profitable.

I find that the big rush in favor of steel hulls, especially the 400 and 500-footers, has been overdone, at least from the standpoint of certain good insurance authorities, and if there is not a somewhat radical adjustment of rates, with steel vessels set well up, it will be because there is too much competition in the business somewhere, for they have proven very expensive to the companies. It was, of course, expected that they would give the underwriters a deal of trouble from stranding; they could not do otherwise unless wooden jackets were provided for them, and that idea has not been in favor of late, though it was hoped that some other good feature would make its appearance, at least as regards steel vessels, in the light of an investment. What is apparently the most unexpected feature of it all is that the big vessels are not better sea boats than they are. An underwriter puts it in this way:

"When these boats began to come out we supposed that they would pay no attention to ordinary storms, but would put out into the middle of the lake and go on about their business, but they do nothing of the sort. A 30-mile wind and they are making for shelter, precisely as the smallest craft would do. To say that we are disappointed would be putting it mild. This may be thought a small matter at first, but it means a good deal, for from it we get such strandings as the Harlem and the Arthur Orr, each of which made a big hole in the earnings of the year. Since that time a big steamer has piled herself upon Isle Royale, and not so very heavy a gale at the time either. The captain was asked how he came to get ashore and he replied, as a matter of ordinary information, that he was running for shelter behind the island and got too close to it."

Well, the steel vessels do not go to the "bone yard" after a term of years anyhow. It takes a dip into deep water to close their career, which is the reason for their running the wooden vessel out, added to the practical giving out of ship timber. Still if the insurance interests have overdone their side of the competition and assisted too much in the effort to get rid of the wooden bottom there will be a grim sort of satisfaction on the part of the owner who has been obliged to carry his own insurance of late on account of the rate on wood that could not be paid. There is not much prospect of such rates coming down, as the wooden fleet is today and as it will be next season and the season after. If it has been discovered that the steel vessel must have a new bottom every few years the business it is in will have to pay for it. It is too late to make any further comparisons with wood.

JOHN CHAMBERLIN.

TRIAL TRIP OF THE ALABAMA.

The battleship Alabama, built at Cramps, Philadelphia, had her official trial trip over the deep water course from Thatcher's island to Boone island off the New England coast on Tuesday. The vessel steamed at an average speed of 17 knots an hour for four consecutive hours without taking into account a strong flood tide, which, when allowances are figured out, will probably contribute a substantial addition to her speed. The Alabama also reached a maximum speed of 18.03 knots for a distance of 6.6 knots, the space between two of the warships marking the course. When the tidal allowances are prepared they will doubtless show that the latest addition to Uncle Sam's navy is the fastest battleship of her tonnage afloat. The general opinion expressed by the naval men on the craft during her trial trip was that her average will be about 17.1 knots an hour for the four hours. The contract requirement for the ship was that she should steam 16 knots an hour for four consecutive hours and the fact that she exceeded that speed goes to show that a bonus is not always necessary to persuade builders to turn out the very best ship they are capable of constructing. In addition to her display of speed, the Alabama executed some curves that made the people on board open their eyes in wonder. The great craft was sent ahead at full speed with helm hard to port and described a circle which had a tactical diameter of between 700 and 800 feet, or a trifle over twice her length. Then the helm was reversed and around she went to starboard, and coming upon the wake of her first circle made as perfect a figure eight in seething white foam as one could wish to see. Before reaching Boston light the vessel was tested to find her quickness in coming to a dead standstill and in gathering sternway with engines reversed, all of which proved satisfactory to the trial board.

A more perfect day for a trial trip could not be had. The sea was as smooth as glass and there was scarcely life enough in the faint easterly breeze to cause ripples on the surface, and the coasting vessels drifted about with sails hanging idly from their spars. The Alabama left her anchorage in the harbor at 8 o'clock, having a number of guests on board in addition to the trial board, which consisted of Rear Admiral Rogers, Capt. Robley D. Evans, Com. J. N. Hemphill, Com. Charles R. Roelker, Naval Constructor W. L. Capps, Lieut.-Com. Charles E. Vreeland and Richard Henderson, and Lieut.-Coms. J. H. Perry and W. H. Hannan, members of the engineering board, of which Commander Roelker is president. Rear Admiral Sampson was with the party as a guest of Mr. Cramp, and a number of naval officers of lesser rank and naval cadets were detailed as assistants to the members of the two boards.

The course was laid out from a point about five miles southeast of Thatcher's island, marked by a can buoy and battleship Texas, to the battleship Massachusetts, about three miles east of Boone island, a total distance of 33 knots. At distances as near 6.6 knots apart as possible were anchored the naval tug Osceola, the battleships Kearsarge, Kentucky and Indiana. There were also numbered can buoys near them. Before reaching the Texas the Alabama had been gradually speeded up and was going at a good 15-knot clip when the signals were given that the ship was about to start on her speed test. The buoy at the beginning of the course was passed at 10:29:35 o'clock and the 33 knots had been reeled off at 12:24:52, the elapsed time being 1:55:17, an average speed of 17.15 knots. Going over the course the battleship covered the distance between the first two marks in 23 minutes 20 seconds, an average of 16.89 knots an hour. To the third mark, the Kearsarge, whose crew gave three ringing cheers for the new ship, the elapsed time was 23 minutes 30 seconds, a speed of 16.85 knots an hour. To the fourth mark the time was the best of the day, 21 minutes 58 seconds for the 6.6 knots, or a speed of 18.03 for an hour. To the fifth mark 24 minutes 15 seconds were required, which makes the speed 16.36 knots, and between the last two marks the time was 22 minutes 14 seconds, a speed of 17.37 knots an hour.

The Alabama turned quickly, repassing the Massachusetts on her return journey at 12:42:26 o'clock, and the Texas at the other end of the course at 2:39:58, making the elapsed time for the 33 knots 1:57:30, an average of 16.85 knots an hour for the distance. Her fastest speed on the return was made over the distance between the Massachusetts and Indiana, the time being 22 minutes 33 seconds, or a speed of 17.56 knots an hour. The vessel was under forced draft all the time, with a steam pressure of 180 pounds, and the maximum revolution of her screws was 118. The established horse power developed was 11,500. Mr. Edwin S. Cramp said the speed test was wonderful; that the machinery worked perfectly, not a bit of water being used to cool the bearings, and that the boilers made steam freely. In fact, the safety valve was blowing off for more than half an hour while she was ploughing over the course. He said no battleship had ever made such a high rate of speed for so many hours of steaming.

NAVAL STATION AT FRENCHMAN'S BAY.

The bureau of equipment, navy department, opened bids a few days ago for a coaling plant to be erected at the United States naval depot at Frenchman's bay. The coaling plant will have a storage capacity for 10,000 tons of bituminous coal, and will be provided with simple, but effective, machinery for handling the coal with the greatest possible dispatch. There were four bidders, who submitted propositions based on their own plans, as well as those of the navy department. The bureau of equipment is now tabulating these offers, but it will take some time to tell which is the most acceptable. The bidders were as follows: McMyler Manufacturing Co., Cleveland, O., two propositions, one $276,500, the other $199,300; Hoffman Engineering & Contracting Co., Philadelphia, four propositions, the lowest $237,000 and the highest $319,825; Snare & Trieste, New York, eighteen propositions, lowest $178,000, highest $248,000; Augustus Smith, New York, three propositions, ranging from $149,000 to $177,318.

A new clam bucket apparatus, known as the Mead hoist, was tried on the hard coal docks of the Philadelphia & Reading Co. at South Chicago a few days ago. In six hours 1,785 tons of coal were taken out of the steamer P. D. Armour. The entire cargo of 2,835 tons was unloaded in about twelve hours. This is about half the time required under former hoists at this dock. The new invention does away with the work of eighteen men in the hold to scoop the coal, except in cleaning up the cargo.

SINKING OF THE SPECULAR.

No accident of the present season on the great lakes has caused so much discussion among vessel men as the sinking of the wooden steamer Specular in Pelee passage, Lake Erie, following collision with the steamer Denver. The men saved from the wreck of the Specular were unable to tell when they reached shore what vessel had struck them. It was expected, of course, that the name of the vessel would soon be known, as such a secret could not be kept by an entire crew. When it was found that the colliding vessel was the steamer Denver, and that no report was made until after she had passed Port Huron, there was some criticism of the action of Capt. Christenson of that ship, especially for not standing by after collision, but in his explanation he claimed that he had no thought of the accident amounting to more than a glancing blow, especially as the injured vessel had immediately pushed on some distance from the scene of the accident. It is true that the Specular was forged ahead at full speed but this was for the purpose of trying to reach shallow water in the few mines that intervened between the collision and the sinking of the injured craft. No statement regarding the accident has been made on behalf of the Specular, but the particulars will come out in an inquiry to be made by the government steamboat inspectors. From such information as can be had from the standpoint of the sunken boat, it appears that the night was quite clear and that the Denver could be seen for a considerable distance; that the mate of the Specular, who was in charge, had blown a porting signal but got no answer; that the signal was twice repeated after Capt. Mooney of the Specular hurried on deck, but without response of any kind from the Denver. Then came the crash and there was just sufficient time to head for shallow water, to rouse the sleepers, to launch one of the yawls, to fill it with a part of the crew and to have the rest take to the rigging. The conduct of Capt. Mooney of the Specular seems to have been most exemplary. He reckoned that the water was not over 30 ft. deep at the point and that therefore a part of his crew could save themselves by climbing into the rigging. To show his faith in his judgment he climbed up after them. The water was about 30 ft. deep. Had it been any deeper a part of the crew would have been drowned. The wreck report of Capt. Christenson, to government officials, made from Milwaukee and evidently under legal advice, is as follows:

"At midnight of Aug. 21 I gave charge of the steamer to the mate, and shortly after 2 o'clock in the morning I heard our steamer exchange passing signals of one blast with some steamer and heard the order 'Hard-a-port.' I went on deck and saw a vessel crossing ahead of us; our vessel swung under her port wheel, but struck a glancing blow with her port bow on the port side of the other vessel, and glancing off the two vessels passed port to port. I at once stopped our engine to stay by the other vessel, which I took to be a large steel barge. I also looked to see if we were leaking, but found our damage evidently slight. The vessel we had struck gave no signal by either engine or large whistle that we could hear, and appeared to continue on at full speed, as I could see her rear mast head light. Soon after the collision other vessels passed close to us, and in the direction of this colliding vessel, which I could only conclude was practically uninjured and had gone on instead of standing by us. After waiting a considerable time we started ahead and I reported the collision to my owners by letter mailed at Detroit, but did not have any idea that the other vessel was much if at all injured until when passing Port Huron we were informed that the Specular had been sunk, and then I concluded that it was probably she that had been in collision with us. Our damages will amount to but little and I think will be found to be confined to the upper works at the bluff of our port bow. I do not know about the damages to the other vessel, as she passed on so fast, but I presume it must have been the Specular we struck."

The wreck of the Specular will very probably be raised, although the job may prove a difficult one on account of the approaching season of bad weather. General Manager Collier and Wrecking Master Johnson of the Great Lakes Towing Co., as well as the representatives of the Swain Wrecking Co. of Chicago, have examined the sunken vessel with a view to bidding on the work of raising her.

A FAST SAILER.

The great German steel built five masted ship Potosi has just completed another record breaking voyage. Lately she ran from off the Isle of Wight to Valparaiso in fifty-five days. She has made several other remarkable passages, completely eclipsing all the records heretofore made by any sailing ship at any time. She is said to be the fastest sailing ship afloat. She was launched June 8, 1895, from Tecklenborg's yard in Germany, and made her first voyage out to Iquique from Hamburg in seventy-two days. The vessel is owned by the well known shipping house of F. Laeisz of Hamburg. Her dimensions are as follows: Length 426 ft. 6 ins., breadth of beam 52 ft. 5 in., depth of hold 32 ft. 9 in. She has a capacity of 6,700 tons, or 620 tons more than the big French sailer La France. The uninitiated may obtain a better idea of her size from the following figures: 5,511,500 lbs. or 2,756 and a half tons of iron and steel was used in her construction, and on her regular trips to and from Iquique and Hamburg she carried easily away from the former place 13,227 bags of saltpeter. She is square rigged on the first four masts and the fifth mast is fore-and-aft rigged. Her sail spread is enormous and she sails just as well, comparatively speaking, in light winds as she does in a gale of wind.

TYPES OF SAILING CRAFT.

HOW THEY ARE DRESSED IN DIFFERENT PARTS OF THE WORLD—THE SCHOONER RIG IS DESTINED TO BE THE SEA-GOING SHIP OF THE FUTURE.

With the exception of scows, catamarans and Chinese junks—the last in a class by itself—sailing craft of all nations are modelled on similar lines, the familiar shape of a rowboat. There may be more or less overhang at either end, the difference in proportional details, but the keel, rounded bilge, wedge-shaped bow, and stern with swelling buttocks, or quarters, are found everywhere. The size of a sailing craft, with the combination of sails used in her makeup, is what classifies her as a ship, bark, barkentine, brig, brigantine, schooner, sloop, yawl, lugger, or one of the host of lateen-rigged vessels known as the felucca type.

Sails may be loosely classed under two general headings—square and fore-and-aft. As the name implies, the former is square, or nearly so, and is hung by its upper edge to a spindle-shaped spar called a yard, which is fastened at its middle to the mast and is steadied by lifts and braces. It is set by hoisting this yard after the lower corners, or clews, are hauled down to the ends of a yard below, and is furled by lowering the yard, hauling the clews and body up to it and bundling the whole on top of the yard in a tapering roll. A lower yard, however, does not hoist or lower, and the clews are hauled down and made fast to the rail of the vessel. Another manner of handling a square sail is to haul it out and in on hoops sliding on the greased yard; and still another, as in the case of a flying square sail, or a stunsail, is to set it from the deck; but greased yards, flying square sails and stunsails are nearly obsolete.

Fore-and-aft canvas is in several distinct designs, the most common and important of which is the trapezium-shaped pattern of a sailboat's largest sail. As a sail alone it has no name, unless a schooner rig is a name; it is a mainsail, a foresail, mizzen, jigger, spanker, or trysail, according to the type of the vessel and the name of the mast which supports it. Its characteristics are its immovable, forward edge, or luff, secured to mast hoop, and its gaff which extends the upper edge. It may or may not have a boom at its lower edge, and the gaff may hoist from the deck or remain fixed up aloft, while the sail travels out and in on hoops. Above this sail in schooners and large sloops is a triangular gaff topsail, filling the space between the gaff and the topmast, and in racing yachts a large light-weather sail fitted with small spars to extend it out past the end of the gaff and up above the topmast head is called a club topsail. Jibs and staysails are triangular, and are hoisted on a fixed, slanting rope, called a stay—whose main mission is to support a mast from forward—which grips the upper edge, leaving the rest of the sail to the control of the sheet—a rope, be it known, not a sail.

Lug sails give luggers their name. A lug is shaped like a schooner's mainsail, but is hung to yards instead of gaff, and when hoisted about a quarter of this yard extends forward of the mast, leaving the forward edge free but for the confining tension of the upper and lower corner—one secured to the end of the yard, the other to the deck. A lateen sail also hangs from a yard; but the sail being triangular, the forward end of this yard is hauled down snug to the deck, and the after end is high in air. It is a picturesque rig, very common on Oriental seas. A leg-of-mutton is a gaffless triangle hoisting on mast-hoops, and extending aft with or without a boom on its lower edge. This design of sails is often used on board large ships for a spanker, or try-sail, on yawl-rigged smaller craft, on sailboats and on pleasure canoes; but wherever used, it is a compromise—a makeshift where a full-out sail with a gaff would be too large.

With sails patterned on these half dozen designs are dressed the sailing craft of the maritime nations; and, until lately, one and all have agreed that the square or ship rig is the most practical and economical for large craft. For centuries the ship was three-masted, but modern experiment has added an occasional fourth mast—square or fore-and-aft rigged; and this she may carry without losing her character, though the appellation "shipentine" has been suggested for her when the fourth mast is fitted with fore-and-aft, or schooner canvas. But no new name has been invented for the full square-rigged, four-master; she is still a ship, like her three-masted sister.

THE SHIP, HER MASTS AND SAILS.

The masts, named with regard to their place, are the foremast, mainmast and mizzenmast; when a fourth is added, it is the jiggermast. Each square-rigged mast is divided into three sections, one above another, called lowermast, topmast and topgallant mast—the latter extending upward as a royal mast, and, in large ships, farther up still as a skysailmast. The schooner-rigged jiggermast is in two parts—lower and topmast. Yards, sails and ropes, with a few exceptions, take their names from the masts or stays to which they belong. The spanker—the small fore-and-aft sail on the mizzenmast—is an exception, and the lower square tail on the same mast is another; it is called the cro'-jack, and these two names antedate nautical history. Old prints picture the two sails in one, as an immense lateen; and, though there may be a missing link, the modern cro'-jack and spanker are no doubt variations from this original type, each retaining some characteristics of the parent.

The three lower square sails, taken collectively, are called courses, and some of the jibs are another instance of arbitrary nomenclature, reversing the rule, and giving their names to the stays which support them. The innermast headsail, or jib, however, wears a logical name. Hoisting on the foretopmast stay, it is called the foretopmast staysail; next is the jib, or, in large craft, the inner jib, which is then followed by the outer jib, and next is the flying jib—these three hoisting on stays called after the sails; and out beyond all is another misnomer, the jibtopsail, on the foretopgallant stay. The trysail, more often called the spencer, is a spanker fitted to the mainmast. Like the foresail, topsails and spanker, is is made of the strongest canvas woven, these sails being the last to be taken off in bad weather. In the spaces between the masts are staysails, each named after the stay on which it sets, and these vary in number with the ship's size and prosperity. Stunsails—light wings rigged out beside the larger square sails—are practically obsolete.

So much for the ship, a complicated fabric requiring trained specialists in the handling, and raved over by certain sea poets as the most beautiful of man's handiwork, as "with straining stunsails above and aloft, storming along before a quartering gale, lifting her clean-lined bow above the surging pillow of foam created by her rush, while the sunlight glints from the burnished copper at the bends like scattering flakes of molten gold, plunging down, down, down, until the lee cathead is hidden in solid green, and a white, shivering cloud of spume blankets the belly of the foresail and thins away to leeward; then, slowly, shaking her head like a swimming dog, lifting to another wild rush over the crest of a sea." So much, too, for sea poetry. She was a wet ship, or badly overloaded. The men who danced attendance on these old-fashioned "stunsails alow and aloft," and who were drenched to the skin by that white, "shivering cloud of spume," had no particular admiration for the rig. Most would have preferred a five-masted schooner with a donkey engine.

THE BARK, BARKENTINE AND BRIG.

Next in order of importance is the bark rig—fore-and-aft canvas on the mizzenmast, square on the fore and main. This rig gives a vessel no special advantage, and is often a detriment in wearing ship (squaring away before the wind to round to on the other tack); but, as a bark is usually smaller than a ship, the dividing of the mizzen canvas into but two parts, spanker and gaff topsail, leaves each not to large to be handled by the crew, and much is saved in cost of running rigging. Barks may range from 500 to 1,000 tons register. Above this tonnage the full square rig is said to be more practical. A further modification of the ship is the barkentine, about the happiest combination possible of the square and the schooner rig. Only the foremast carries yards and square sails, the main and mizzenmast being schooner rigged. This gives the craft the advantage of fore-and-aft canvas in beating to windward, while leaving her the only good feature of a ship, a well balanced and braced square rig forward to scud under in bad weather.

Now comes the brig, what might be called a two-masted ship. She has no mizzen mast, and is full square rigged on the fore and main, and. having been a failure from the time of her inception, she has nearly disappeared from the seas. Possessing but two points of wind contact, and with the cumbersome square rig, she was hard on the helm, and often missed stays in going about, though in wearing she had the same advantage over bark and barkentine as has the ship. But the brig was the favorite craft of certain old-time gentlemen of fortune who roamed the seas, gathering what they found. As her successor she has left us the hybrid known as the hermaphrodite brig, or, with regard to slight difference of detail no longer considered, the brigantine—half brig, half schooner. She came into being in the days when schooners—the next distinct type—were small and carried but two masts. A vessel too large for a schooner and too small for a brig took the salient features of each—the large mainmast, mainsail and gaff topsail of a schooner and the square-rigged foremast of a brig. But the combination was not so successful as in the case of a bark, for the bark retained the short mizzenmast of the ship, and a comparatively small spanker, easy to shift over in a following gale. But a brigantine, with her longest mast aft, and, fitted to it the large mainsail of a schooner, must, when running before a strong gale and in need of jibing, get that great expanse of canvas over against the full force of the blast. It is the position most trying to a schooner, and the brigantine has borrowed her one weakness—the largest sail furthest aft. But with that mighty mainsail stowed and out of the way, she may scud under her square forward canvas as long and as safely as may her larger sisters. A lesser departure from the schooner-rig to the square was the topsail-schooner, a two-masted craft, schooner-rigged except that aloft on the fore were a square topsail and a top-gallant sail in place of the foregaff-topsail; but this craft is now as rare as the brig, and need not be considered.

The schooner is coming to the front. Originally of two masts—an enlarged sloop—she grew larger and acquired a third, then a fourth, and of late years a fifth. There is now a fleet of five-masted schooners sailing out of Atlantic coast ports as large as the medium sized ship-rigged craft, and able to follow—and beat them—through any battle with the wind and sea that may be met. A seven-master is soon to be launched from a Rhode Island ship yard and she may be followed by eight-masters. There seems to be no limit to the number of masts except the size of the hull, but it is noticeable that though the masts increase in number they increase but little in length, the additional sail area coming of the extra masts. And, as a tribute to tradition, the builders insist upon fitting the mast farthest aft with the largest sail, thus perpetuating the schooner's sole weakness. With her line of spars of the same length, the multi-masted schooner is the ugliest craft afloat, but, aside from the trouble of gybing the large after sail, she is the handiest, and will, doubtless, supercede the square-rigged ship in deep water sailing. She can show as much canvas to a fair wind as can a ship, and in a head wind can sail two points closer and beat to windward in a breeze and sea that would throw a ship ashore. The sloop rig, mainsail and jib, which may be supplemented by extra jibs, gaff-topsail and spinnaker, is the rig of sailboats, English cutters and racing yachts. It is too common to need comment, except that experiment and comparison have decided that more speed per sail area can be produced with this rig than with any other.

VARIOUS TYPES OF STRANGE SAILS.

In the English channel and along the French and Spanish coasts can be seen a picturesque craft about the size of two-masted schooners, called a lugger. She carries three pole masts and a short bowsprit and spreads three lofty lug sails and two or three jibs. About the mainsail is sometimes set what might be called a club topsail, but what is really a miniature lug. As her spars are proportioned like those of a ship or bark, she avoids the unsightliness of the American schooner, but, of course, can never compete with the latter in convenience.

Throughout the Mediterranean, Red sea, Persian gulf, and along the shores of the Indian ocean, can be found the lateen sail in all its combinations and modifications. Combined with a few square sails it is the main dependence of the three-masted xebec; hoisted on two masts with a triangular topsail spread slantingly between the two lateen peaks, it propels the settee; on one mast with a jib out ahead it stamps a small craft as a tartan; and spread on three masts in naked simplicity, with no embarrassing topsails or jibs it makes up the dress of a felucca. A Persian garookuh carries one mast raking forward from near the center and one lateen sail. An Arab dhow and Malabar pattemar are alike in rig—two masts, the longest forward, and differ only in size and hull. Proas and pirogues are really catamarans, built with out-riggers and they are similar in rig; but the one sail is neither lateen, nor lug, being a curious combination of both, with a boom on the lower edge.

Lastly we come to the nondescript Chinese junk, a dingy brown scow

model with two, three or five shroudless masts of any length and proportion, stepped down hatchways or over the side, with lug sails of bamboo matting stiffened by bamboo splinters, and the inevitable perforated rudder and painted eyes keeping lookout from the bows. The junk is as inscrutable as the race which designed her; but as she can never go far to sea, she will never compete with other types in the navigation of the future. Neither can any other form of lug or lateen or square sail. The sea-going ship of the future will be schooner rigged.

COMMERCE WITH HAWAIIAN ISLANDS.

The people of the United States are likely to be deprived of some much desired information regarding the commerce of the United States with the Hawaiian islands. The recent act of congress which extended to these islands practically all of the laws of the United States is construed as rendering the commerce between the United States and the islands "coastwise" in its character. The laws with reference to the gathering of statistics of our commerce require importers and exporters to file with the collectors of customs at the ports at which their goods enter, or at which they leave the country, a specific statement of the quantity and value of each article imported or exported. The law does not require, however, this detailed information with reference to goods passing from one port of the United States to another port of the United States. Taking advantage of this condition merchants of San Francisco who are engaged in the trade with the Hawaiian islands are refusing to furnish to the collector at that point, regarding goods sent to or from the Hawaiian islands, the general class of information which they have for years been furnishing, but from which they claim they are now exempt under the new conditions.

The effect of this will be to deprive the treasury bureau of statistics and the people of the United States, at present at least, of all information regarding the commerce with the Hawaiian islands. No feature of our import and export trade has attracted so much attention during the past year as that with the Hawaiian islands. It was one spot where the effect of annexation upon commerce with the territory annexed could be studied, since in the other territories brought into close relations with the United States, conditions were not in our favor by reason of the war which had existed previous to or immediately following the new relationship. While the growth of our commerce with Porto Rico, Cuba and the Philippine islands had been very great, it has been difficult to determine what proportion of the growth was due to war conditions or what proportion to the new relations thus established. In the case of the Hawaiian islands, however, no war conditions existed, either previous or subsequent to annexation, and the growth of the commerce with the United States may be attributed chiefly, if not wholly, to the close relations brought about by annexation and the general business revival which followed that event.

The growth of our commerce with the Hawaiian islands in the last few years, especially in the years 1899 and 1900, has been phenomenal. This growth is especially interesting in view of the new relationship which has been established with the islands and the marked increase which accompanied the final determination of that event. In 1890 the exports of the United States to the Hawaiian islands were $4,711,417 and in 1897 $4,690,075, showing no growth from 1890 to 1897. In 1890 the imports into the United States from the Hawaiian islands were $12,312,098 and in 1897 $13,687,799, showing but a slight growth.

The treaty of annexation was signed at Washington June 16, 1897, so that all the commerce of the fiscal year 1898 felt the effect of that step in the process of annexation. In that year the exports of the United States to the Hawaiian islands were $5,907,155, an increase of 27 per cent. over 1897, when they amounted to $4,690,075. The treaty was ratified July 7, 1898, and sovereignty over the islands formally transferred to the United States on Aug. 12, 1898, thus bringing practically all of the fiscal year 1899 within the period following the complete annexation. The exports to the Hawaiian islands in the fiscal year 1899 amounted to $9,305,470, an increase of over 50 per cent. On the import side the year 1898 showed an increase of $3,500,000 over 1897 and the year 1900 showed another increase of $3,500,000 over 1898 and 1899.

CIVIL SERVICE POSITION FOR MASTER.

The United States Civil Service Commission announces that it is desired to establish an eligible register for the position of master in the Quartermaster's Department at Large. No scholastic test will be given, but applicants will be graded upon the elements of age, experience, intelligence, character as a workman, and physical qualifications, as shown by the information furnished in connection with their formal applications. It will not be necessary for applicants to appear at any place for examination. From the eligibles resulting from this examination certification will be made to the position of master on the quartermaster's steamer General Ayres, at Boston, Mass., at a salary of $110 per month.

This examination is open to all citizens of the United States who comply with the requirements and desire to enter the service. All such persons are invited to apply, and applicants will be graded and certified with entire impartiality and wholly without regard to any consideration save the grade given them. Persons who desire to compete should at once apply to the secretary of the local board of examiners at Boston, Mass., or to the United States Civil Service Commission, Washington, D. C., for application form 1093, which should be properly executed and filed with the commission prior to the hour of closing business on Oct. 1.

The navy department has been notified by the Harlan & Hollingsworth Co., Wilmington, Del., builders of the 30-knot torpedo boat Stringham, that the vessel made a very satisfactory trial trip, her engines and boilers working perfectly, but that she failed to develop her full contract speed, and they have requested permission of the department to fit her with higher speed propellers. It is believed by the navy department that with this change the Stringham will easily come up to the 30-knot limit.

The monitor Wyoming will be launched from the ship yard of the Union Iron Works, San Francisco, on Sept. 8. Miss Frances Warren, daughter of United States Senator F. E. Warren, will christen the monitor.

BUILDING BOATS FOR WARSHIPS.

One of the most important and interesting of the shops at the Charlestown navy yard is that in which the ships' boats are built. This yard sends out many of the navy's finest specimens of small boats, and builds them at a very low cost to the government compared with the expense of constructing similar types at other stations. The explanation of this is in the fact that the Charlestown yard is in the very heart of the boat-building section of the country, and that skilled workmen are always available. Materials for construction are obtainable at minimum cost. At present about seventy-five men are employed in this shop, under the supervision of Master Boatbuilder Robertson, who has had years of experience in this line of work and knows it thoroughly from the laying of the keel to the finishing touches. The boats built here are of the types most in use in the navy, and are divided among six classes: Twenty-foot cutters and whaleboats, 26, 28 and 30-ft. cutters, 28-ft. whaleboats, 30 and 33-ft. steam cutters. The standard types of boats in use in the United States navy are: Steam cutters, balsas, launches, barges, gig whaleboats, cutters and dinghies. The shop has orders ahead for about forty boats of different classes, including several steam cutters. Work is in progress on three steam cutters, two 28-ft. cutters, one 28-ft. whaleboat, four 20-ft. cutters, two whaleboats and the boats of several of the ships undergoing repairs at the wharves are being renovated.

The vital importance of the launches, cutters and other small boats carried on board ships of war in all the navies of the world is great, their small size being no indication of their value either in actual warfare or in the performance of peaceful duties. The number and types of boats on each ship varies according to the use to which they are to be put. For instance, a battleship requires a vastly different set of boats from a torpedo boat. The former's boats must have a capacity sufficient to accommodate all her officers and crew either for a landing party or to allow them to reach shore safely in case their ship has to be abandoned at sea; the torpedo boat's outfit will probably be used very little except for transporting her crew. In a word, the largest ships must have enough boats to carry from five to six hundred men, while the smallest class need only enough to take care of thirty or forty. The amount of time, the cost of material and labor consumed in building a steam cutter will astonish anyone unacquainted with the facts. The ordinary person when he reads where some ship has lost a steam cutter or has had a boat or two shot away, thinks of it as merely an incident whereby the government loses a few dollars. When he learns that these cutters cost about $6,000 each and occupy a year in building his views change.

The engines aboard the cutters are very powerful and can drive them through the water at the rate of from 10 to 14 knots an hour under favorable conditions. They have a sail area of 372 sq. ft., but this is hardly ever taken advantage of except in an emergency. A 40-ft. steam cutter weighs over 10,000 lbs. and has a bunker capacity for 1,600 lbs. of coal. These cutters represent the maximum of cost, weight and speed in small boats. It takes about 200 days to complete one. The minimum of cost is represented by the 10-ft punt which weighs 369 lbs., can be built in ten days, and costs less than $70, $45 of which is for labor. Between these two extremes come the other classes, twenty-nine in all. Down to the 24-ft. cutters all are fitted with an ordnance circle. This circle is to hold in place a small machine gun in cases of emergency, and weighs 30 lbs. The other outfits furnished to this class of boats are: Equipment 780, water supply 1,525, coal 1,600, or a total of 3,938 lbs. The punt carries no outfit, and is used principally for cleaning ship. Punts are of no use in making a landing or in abandoning a ship at sea. Of course, no one likes to think of such an emergency, but every precaution must be taken.

"Well, I thought I knew all about every kind of a boat," said an old man who was being shown through the boat shop recently, "but I've never heard of a balsa; and what is the boat you call a dinghy?" A balsa is nothing but an improved life raft fitted with oars and sails. It is an invention of Admiral Ammen, who has more recently come into prominence as the designer of the Ammen ram Katahdin. Although the balsas have proved more successful than the ram, they are not being built for the navy at the present time. The balsa consists of two large cylinders which serve to buoy up a platform. The dinghies are nearest to an ordinary lap-streak row-boat of anything in the navy. They are usually finished in hard woods, polished mahogany being frequently used. That they are much more elaborate than the row-boat is evidenced by the fact that the 20-ft. type, for instance, costs nearly $500.

Every boat that is built in a government navy yard, or by private contract, is made from plans drawn especially for it. It makes no difference how small a boat is, the plans are sent on from the department at Washington, and every detail has to be carried out as they call for. Plans for steam cutters are very elaborate and cover seven sheets of blue paper. When they are drawn up the boat is assigned a number, and thereafter it is known officially only by this number. Boats built at navy yards have letters prefixed to their numbers as follows: Portsmouth, P; Boston, B; New York, Y; League Island, L; Norfolk, N; Mare Island, M; Pensacola, F; Port Royal, R; Washington, W; Puget Sound, S. Those built by contract are lettered C. The letters precede the number in the following manner: Y-160 will represent the 160th boat built at the New York navy yard; and thus designated, the bureau of construction and repair, under which it was built, can trace its history. These numbers are used in surveys and in correspondence relative to boats. All articles belonging to each boat are marked with its number. In the boat shop, as in every other division of the navy yard, a lot of red tape has to be cut before actual work can be begun. The blue print plans and the accompanying letter authorizing the construction of the boat which they call for are first carefully scrutinized by the naval constructor and then are handed to a clerk who makes record of their receipt, the class of boat to be built, its cost, and other minor facts regarding it. Next they go down to the office of the master boatbuilder, where more records have to be made. Finally the plans are placed in the hands of the workmen. After the timber has been selected and sawed, the keel and stem are set in position and a few days later the ribs are up. A gigantic skeleton of some extinct mammal most closely resembles the boat at this stage. But this is soon altered by the planks, and finally come the finishing of the interior and the painting of the whole boat.

PRODUCTION OF IRON ORE.

NEARLY TWENTY-FIVE MILLION LONG TONS MINED IN THE UNITED STATES IN 1899—MICHIGAN AND MINNESOTA STILL LEAD—ANNUAL REPORT OF UNITED STATES GEOLOGICAL SURVEY.

John Birkinbine of the United States geological survey has submitted his annual report on the production of iron ore in the United States for the year ending Dec. 31, 1899. The total is 24,683,173 tons, which is 5,249,997 long tons, or 27 per cent., in excess of the previous maximum of 19,433,716 long tons in the year 1898. The records of 1898 and 1899 represent the maxima of iron ore mined in any country in one year, the nearest approach to these being a total of 18,062,049 long tons won in the year 1880 in England. The augmented production was principally from the states of Minnesota and Michigan, the former being credited with an increase of 2,197,780 long tons and the latter with 1,799,311 long tons over the 1898 output.

The amount of pig iron manufactured in the year 1899 was 13,620,703 tons, and if all the ore mined in the United States in that year had been smelted in the production of this pig iron it would show that 1.81 tons of iron ore were required to make a ton of pig iron, but allowance must be made for the difference in the stocks of ore, the foreign ore imported, the ore used for other purposes than for pig iron manufacture and the other iron bearing material fed to the furnaces. If to the amount mined in 1899 is added the decrease in the stocks of ore on hand at the mines, the amount of foreign ore imported, etc., the grand total sent to the consumers will approximate 26,000,000 tons.

The output of iron ore in the United States for the years 1889 to 1899, the period during which data were systematically collected by the United States geological survey, was as follows: 1889, 14,518,041 long tons; 1890, 16,036,043; 1891, 14,591,178; 1892, 16,296,666; 1893, 11,587,629; 1894, 11,879,679; 1895, 15,957,614; 1896, 16,005,449; 1897, 17,518,046; 1898, 19,433,716; 1899, 24,683,173. Total for eleven years, 178,507,234 long tons. From this it will be seen for eleven years the average product has been 16,227,930 tons per annum. In the years above mentioned—viz., 1889 to 1899, inclusive—when 178,507,234 long tons of iron ore were mined, 101,141,857 long tons of pig iron were smelted, representing an average of 1.76 tons of domestic ore mined per ton of pig iron made.

In all the different classes of ore—red hematite, brown hematite, magnetite and carbonate—there was a general increase in production, due to active demand upon local mines to supplement ore obtained from large producers. Quite a number of iron ore deposits which had not been wrought for years resumed operations in 1899, and in some instances exploitations will be continued. The advantages to blast furnaces of at least a partial local supply of ores and the application of improved mining methods will probably encourage working some of the deposits which during the business depression were inactive. Michigan is the largest producer of red hematites, followed in order by Minnesota and Alabama. Virginia heads the list as a source of supply for brown hematites, Alabama and Tennessee taking second and third places respectively. Pennsylvania produced the largest amount of magnetite, followed by New York and New Jersey, while Ohio contributed the greatest amount of carbonate ore. The production of iron ore of all kinds by the different states was as follows:

OUTPUT OF THE DIFFERENT STATES.

Michigan, 9,146,157 long tons; Minnesota, 8,161,289 tons; Alabama, 2,662,943 tons; Pennsylvania, 1,009,327 tons; Virginia and West Virginia, 986,476 tons; Tennessee, 632,046 tons; Wisconsin, 579,798 tons; New York, 443,790 tons; Colorado, 307,557 tons; New Jersey, 256,185 tons; Georgia, 236,748 tons; Nevada, New Mexico, Utah and Wyoming, 54,148 tons; Ohio, 53,221 tons; North Carolina, 47,616 tons; Kentucky, 35,384 tons; Connecticut and Massachusetts, 29,611 tons; Missouri, 22,720 tons; Texas, 14,729 tons; Maryland, 3,428 tons. Grand total, 24,683,178 tons. Considering the production of the different classes of iron ore for the period of eleven years, during which the United States geological survey has collated statistics, it is found that the red hematite mines have furnished about three-fourths of the total, followed in order by those producing brown hematite, magnetite and carbonate ore. The amounts of each variety mined in the United States were as follows: Red hematite, 16,150,684 long tons; brown hematite, 1,989,681 tons; magnetite, 1,237,978 tons; carbonate, 55,373 tons; total, 19,433,716 tons. Notwithstanding the active demand in the year 1899 the output of magnetite is but slightly above the maximum of 1891. The amount of brown hematite won was greater in 1889, 1890 and 1891 than in 1899, and prior to 1895 the quantity of carbonate ores annually mined exceeded the record of 1899.

VALUE OF THE ORE.

Owing to the fact that most of the iron ore mines make contracts with the consumers in the early portion of the year the prices for iron ore did not show such a marked advance in the year 1899 as they will in the year 1900, when the miners participated to a greater degree in the increased demand and good prices for iron and steel. It is possible also that the control by steel manufacturers of a large proportion of the important mines may exert a controlling influence on the sales and the shipments of ores from the Lake Superior mines to distributing ports on the lower lakes. The total value at the mines of the 24,683,178 long tons of iron ore produced in the year ending Dec. 31, 1899, as reported by producers, was $34,999,077, or $1.42 per long ton; an increase of 28 cents, or 24.6 per cent. over the average value of $1.14 per ton, as given in 1898. The highest average value placed on iron ore at the mines is for the state of New Jersey, where the expense of mining is considerable, or the ores do not have long hauls to reach the blast furnaces; they therefore command a higher price per ton at the mine than many other ores. The lowest average cost, 90 cents per ton, was in Texas, where a portion of the iron ore is obtained by convict labor.

The Lake Superior region increased its former maximum output of 13,779,308 long tons in 1898 to 17,802,955 long tons in 1899. These figures are those of production and not shipments, for the latter are considerably in excess for 1899, owing to the fact that stock piles at the mines were reduced during the year. The amounts mined from the various ranges during the past two years were as follows: Marquette, 1898, 2,987,930 tons; 1899, 3,634,596 tons; Menominee, 1898, 2,275,664; 1899, 3,281,422; Gogebic, 1898, 2,552,205; 1899, 2,725,648; Vermillion, 1898, 1,125,538; 1899, 1,643,984; Mesaba, 1898, 4,837,971; 1899, 6,517,305; total 1898, 13,779,308; 1899, 17,802,955. With the exception of the Gogebic all of the ranges mined their maximum product in the year 1899, the Gogebic reaching its greatest total in the year 1892. Considering the ranges in the order of their product in 1899, the Mesaba range, with its rich, easily mined ores, is first with a total of 6,517,305 long tons. The Marquette range, the one first opened, continues to furnish a large proportion of the output of the Lake Superior region, 3,634,596 long tons being the record for 1899. This range has shown a continued increase since 1894. The Menominee range reached the 3,000,000 mark for the first time in 1899, when it contributed 3,281,422 long tons. The Gogebic range, though a constant producer, mining 2,725,648 long tons in 1899, has not equaled its 1892 output, when 3,058,176 tons were mined, nor even the 1890 total. The Vermillion attained its maximum of 1,643,948 tons in 1899.

MICHIGAN AND MINNESOTA THE GREAT PRODUCERS.

Michigan continues to hold first place as a producer of iron ore, and the only state which is likely to contest this position in the near future is Minnesota. The amount contributed by Michigan in 1899, 9,146,157 long tons, was 37.1 per cent. of the United States total, practically the same proportion as in 1898, when but 7,346,846 long tons were mined. The increase on the 1898 record was 1,799,311 long tons, or 24.5 per cent. Of the 1899 product 8,863,942 long tons, or 96.9 per cent., was red hematite; 237,570 long tons, or 2.6 per cent., magnetite, and 44,645 long tons, or 0.5 per cent., brown hematite. The state ranked first as a producer of red hematite, fourth in the list of magnetite producers and eighth in the supply of brown hematites. The total value of the 9,146,157 tons of ore mined was $13,707,899, or $1.50 per ton. This is the value for the ore at the mine, not including transportation. Owing to the great demand for iron ores some deposits which had been classed as abandoned or were temporarily inactive, were again exploited and exploration work was quite active. Lean Bessemer ore and also some relatively high phosphorus ores were shipped, which in previous years could not have been marketed, but these aided in swelling the total production of the state in 1899. The semi-centennial celebration of the Cleveland Cliffs Co. at Ishpeming emphasizes the marvelous development which has made the Lake Superior region famous. The Cleveland mine was one of the pioneer enterprises which in fifty years has resulted in a mining industry unequaled in the history of the world.

All of the 8,161,289 long tons of iron ore contributed by Minnesota was of the red hematite variety, in which class the state occupies second place, with the same rank in the list of producers. The increase was 2,197,780 long tons, or 36.9 per cent. over the 1898 total of 5,963,509 long tons. On both the Mesaba and Vermillion ranges exploration work has been carried on, and the claim is made that the reserves on the Mesaba range represent double the quantity of iron ore which has been mined from the Lake Superior region in its history of fifty years. The use of steam shovels at some of the large deposits of the Mesaba range, and the prominence given to these by published articles, has resulted in a widespread opinion that most of the Mesaba ore is won in this way. Such, however, is not the case, for some of the large producers win the ore from underground exploitations. The handling of the stripping and of the ore by steam shovels at the important mines has reached a degree of perfection which is most creditable. A record of 6,000 tons of ore dug and loaded by one machine in 9 hours indicates what can be done under favorable conditions, but it would be unfair to gauge a season's work by this or by shorter records when from 9 to 12 tons per minute were placed upon cars.

A total of 2,662,943 tons of iron ore contributed by Alabama in 1899 gave it third place as a producer, this amount being 261,195 tons, or 10.9 per cent., in excess of the quantity mined in 1898. Of the 1899 total 1,911,097, or 71.8 per cent., was red hematite, and 751,846, or 28.2 per cent., brown hematite. Alabama occupies third position as a producer of red hematite and second rank as a miner of brown hematite.

A MOST EXQUISITE CATALOGUE.

The Brown Hoisting & Conveying Machine Co. has issued a catalogue which for sumptuousness of execution and beauty of design has rarely been equalled. It is a book of 143 pages, beautifully bound in boards. The catalogue explains the Brown system of handling materials, shows some representative plants designed and built by the company and illustrates the adaptability of the Brown system to widely differing conditions of work. The Brown company are engineers, designers and manufacturers of complete plants for the rapid and economical handling of material, using the well known system invented by Alexander E. Brown, vice-president and engineer, all of whose patents, as well as many others, are now owned or controlled by this company. The Brown patents embrace special machinery for the rapid handling of coal and ore, high-speed gantry and cantilever ship building and yard cranes and furnace hoists, and the other patents include a full line of cranes of all kinds, embracing the well known Yale & Towne patents.

It is in the copiousness of illustration that this catalogue excels all others. Several of the views are of double page width and most exquisite workmanship. The views of the ore docks, showing the standard bridge tramways of the Brown company, are of especial excellence. The views from the great ship building yards, showing the electric cantilever ship building cranes, too, are beautiful. There is also included in the book an instructive diagram on Lake Superior iron ore shipments, showing the decrease in freight rates with the increase in tonnage from 1883 to 1899, which decrease, it is represented, is due almost entirely to the "Brown-hoist."

The directors of the Boston Tow Boat Co. in order to provide increased facilities for transacting the business of the company by building a new steamer and for other purposes connected with the business, have voted to increase the capital stock from $1,000,000 to $1,250,000. The Boston Tow Boat Co. is now paying an extra dividend of $5 per share declared from the surplus net earnings to stock of record Aug. 20.

The mammoth Pacific Hill liner at New London, Conn., and the International liners at the works of the Cramps are being built under the survey of the British Lloyds. The Pacific Mail steamers at Newport News will be classed by the American Bureau of Shipping.

ITEMS OF GENERAL INTEREST.

The battleship Wisconsin will be ready for her preliminary trial trip on Sept. 15. She will go first to Puget Sound to be dry docked and cleaned.

Mr. Herbert C. Sadler, assistant to Prof. J. H. Biles of the Elder chair of naval architecture in Glasgow university, has been appointed to the newly-instituted chair of naval architecture in the University of Michigan.

The navy department has ordered that the former Spanish cruiser Reine Mercedes be towed from the Norfolk navy yard to the yard at Portsmouth, N. H. It is learned that the Mercedes will be converted into a receiving ship.

It is announced from the New York sales department of the Bethlehem Steel Co. that the office of the company at 502 North Second street, St. Louis, has been discontinued and that the territory heretofore covered by that office will be handled from the Chicago office.

The United States cruiser Denver, which is building at Neafie & Levy's, is beginning to make a showing, and it is expected that work upon her will soon begin to advance more rapidly. Nearly 90 per cent. of material to be used in the construction of the cruiser is already in the yard.

The International Navigation Co. of Brooklyn was incorporated in New York last week with a capital of $200,000 to operate a line of steamers on Lakes Erie and Ontario and the Niagara river. The directors are William P. Williams, William C. Davidson, Gustav J. Weiderholt, Frank M. Meekes and Milton J. Williams.

The Marine Engine & Machine Co., with principal offices at Harrison, N. J., was incorporated at Trenton, N. J., recently. The objects of the new company are to build ships, launches, etc. The incorporators are: Miller F. Moore, John B. N. Shawell and Albert D. Miller. The new company is capitalized at $500,000.

The Hilles & Jones Co., Wilmington, Del., is shipping punching and shearing machines, straightening rolls, angle shears and general shop tools to the William R. Trigg Co.'s ship yard, Richmond, Va. A pair of large bending rolls are being made for the same concern. A large punching machine will go forward shortly for a Mexican house.

The monitor building at the Bath Iron Works, known as No. 8, will be fitted with the Brown patent steam tiller with hydraulic telemotor attachment. This gear is the standard British gear, the steam cylinder being directly attached to the tiller, and it is used almost exclusively on the large vessels of the British merchant marine and navy. The Hyde Windlass Co. is the American representative of the Brown company of Edinburgh, the patentees of the gear.

CHARTS OF THE ST. LAWRENCE.—It frequently happens that owners of steam yachts passing between the lakes and the Atlantic want charts of the St. Lawrence river, and want them in a hurry. The Marine Review has them on hand all the time—complete from Lake Ontario to the Gulf of St. Lawrence.

IMPORTANT DISCOVERY.

Experiments at the French Academy of Sciences, Paris, would indicate that bioxide of sodium will soon be used extensively in diving operations and in all manner of submarine work. It appears that bioxide of sodium is found to possess the peculiar property of renewing the oxygen in the air that has been breathed and absorbing the carbonic gas exhaled. Thus a diver can remain under water and walk about without having the air renewed by the pumping apparatus at present employed. Ample proof of all that is claimed for this new discovery has been made before the academy. Lately two men put on a diving dress from which the air had been rigidly excluded and remained inclosed therein for two hours without suffering any inconvenience from foul air or lack of air. The same men also remained under water in the Siene for more than half an hour. It needs no prophetic foresight to comprehend the value of this new discovery. If all that is claimed for it is true miners will be able to penetrate into poisonous gases and foul air and firemen into smoke without fear of being overcome by asphyxiation, and it will also render submarine navigation and deep-sea diving practical. Considered from the last standpoint its value to the maritime interest can hardly be overestimated. Hitherto the greatest depth attained by divers has been about 190 ft. and at that depth the pressure is nearly 80 lbs. per sq. in. The main difficulty is not in building a suit strong enough to withstand the pressure, but in supplying and forcing the air so far down. At depths ranging from 200 to 500 feet near the land bordering on the various bays, seas and inlets a multitude of wrecks with cargoes of untold value lie at present beyond human reach. This discovery, if its claims hold out, bids fair to furnish the means of reaching these and may be used in many other ways, as for example, in cleaning ship's bottoms at sea, in exploring hidden depths, etc.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of August 29, 1900.

NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire	34¾	36¾	34¾	36¾
American Steel & Wire, Pfd	74⅞	75¼	74⅞	75¼
Federal Steel	33¾	35	33¾	35
Federal Steel, Pfd	.....	.....	.....	.....
National Steel	26	27	26	27
National Steel, Pfd	85	85½	85	85½
American Tin Plate	27⅛	29	27⅛	28¼
American Tin Plate, Pfd	79	.....	.....	79
American Steel Hoop	19½	20¼	19½	19⅞
American Steel Hoop, Pfd	.....	.....	.....	.....
Republic Iron & Steel	12½	12⅞	12½	12⅞
Republic Iron & Steel, Pfd	54	55	54	55

THE BRITISH COAL SUPPLIES.

Many British papers are considerably agitated over the talk of disappearing coal supplies in the empire. But there are champions of hopeful views who throw cold water on the predictions that the United States will export a large amount of coal to Great Britain in the near future. One terrified writer suggests that the government take hold of the mines. F. Foster Brown holds to the opinion that the supply of coal in the United Kingdom will last for 300 years at the present rate of production, though the cost of raising coal will be largely increased. Another writer, Prof. Hull, author of "Coal Resources at the End of the Nineteenth Century," supplies the London Chronicle with the following table, showing the workable coal in British mines in veins of 2 ft. and upward down to a depth of 4,000 ft. to be 82,155,000,000 tons in six coal fields, as follows:

Northern	6,000,000,000
Midland	35,000,000,000
Northwestern	11,000,000,000
Western	2,000,000,000
Welsh	20,000,000,000
Scotch	8,000,000,000
Irish	155,000,000
Total	82,155,000,000

This is equivalent to a supply for more than 300 years, if 250,000,000 tons per annum is mined. The actual amounts of coal mined in and exported from the United Kingdom in the years named have been as follows:

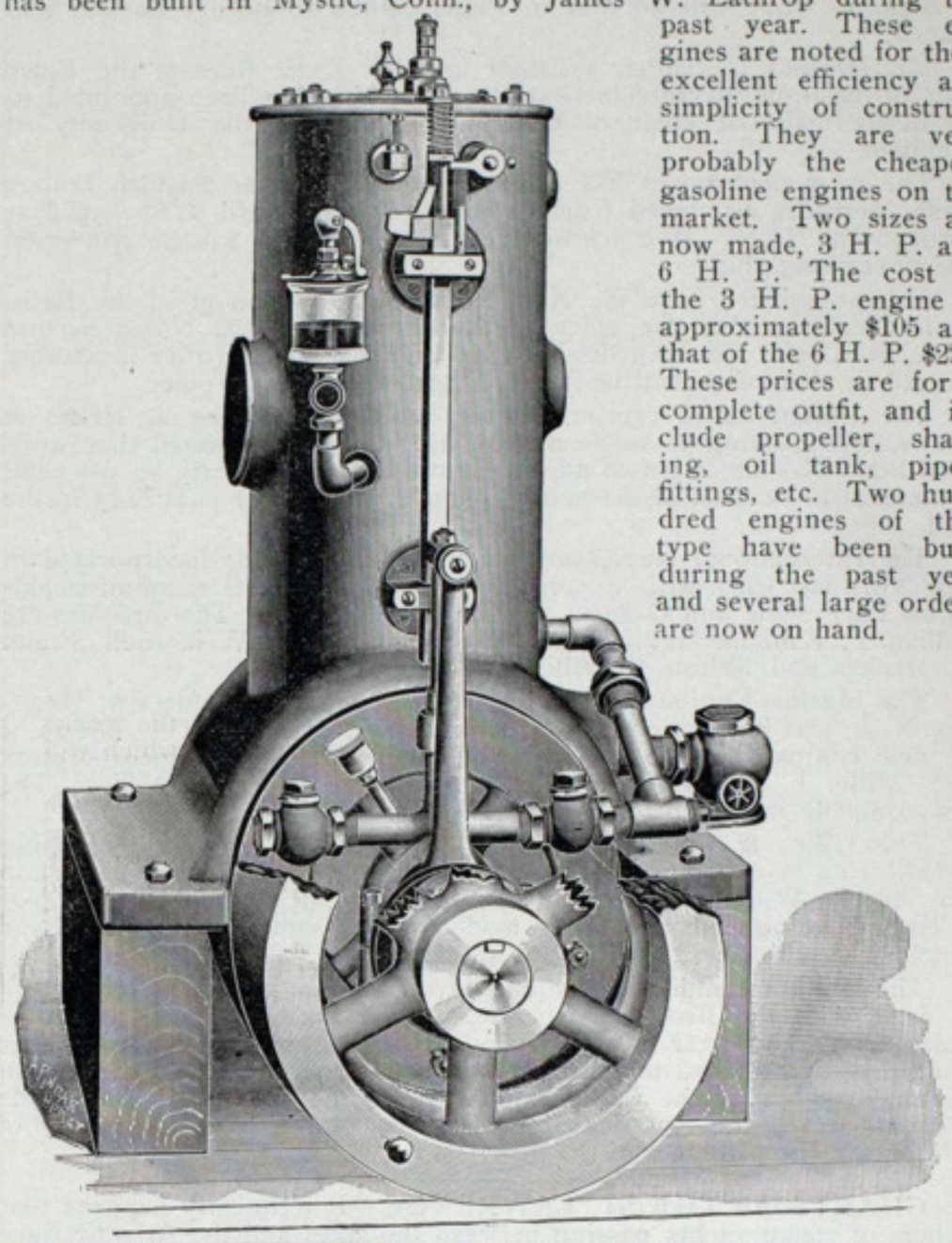
	Coal mined. Tons.	Coal exported. Tons.
1895	189,652,562	31,714,906
1896	195,351,955	32,947,680
1897	202,119,196	35,354,296
1898	202,042,243	35,058,430
1899	220,085,368	41,180,302

During the six months ending June 30 the exports were 22,063,205 tons, or more than 1,000,000 tons greater than in the same period of 1899 and 5,600,000 tons more than in the first six months of 1898. Coal has advanced five shillings per ton in England recently.—Coal Trade.

German ship yards had thirty-eight warships for Germany and foreign countries on the stays in 1899. The rapid growth of the industry is seen from the fact that thirty-two new slips are in course of construction or projected, which is nearly 50 per cent. of existing slips. On the Baltic, where the German ship building industry is chiefly situated, there are twenty-one slips of above 500 ft. in length. Germany now has twenty-seven floating docks, against seventeen in 1890 and nine in 1880. The number of workmen now employed in the yards is about 35,000.

LATHROP GASOLINE ENGINE.

The accompanying cut shows the type of gasoline engine that has been built in Mystic, Conn., by James W. Lathrop during the past year. These engines are noted for their excellent efficiency and simplicity of construction. They are very probably the cheapest gasoline engines on the market. Two sizes are now made, 3 H. P. and 6 H. P. The cost of the 3 H. P. engine is approximately $105 and that of the 6 H. P. $225. These prices are for a complete outfit, and include propeller, shafting, oil tank, pipes, fittings, etc. Two hundred engines of this type have been built during the past year and several large orders are now on hand.



WITH ATLANTIC COAST BUILDERS.

A FEW ORDERS FOR NEW SHIPS—NEW KEELS FOLLOW LAUNCHES IN THE BATH YARDS THAT BUILD WOODEN VESSELS.

A contract for the construction of a ferry boat to take the place of an old craft on the Bath-Woolwich route has just been secured by the Bath Iron Works of Bath, Me. The vessel is to cost $23,000 and is to be finished Dec. 15. The plans were prepared by Mayor Chas. W. Hyde of Bath, who is consulting engineer of the Bath Iron Works. The vessel will have a propeller wheel at each end. Her dimensions are as follows: Length of keel, including the two inner posts, 76 ft.; length of deck over all, 94 ft.; breadth of beam at deck, 26 ft.; breadth over all, 31 ft. 4 in.; depth of hold, 11 ft. The machinery is to consist of two double cylinder, non-condensing engines, one on each end of the boat, working on separate shafts; the cylinders to be 9½ in. diameter by 14 in. stroke, to work either upon right angled cranks or to be placed with center lines at right angles and working on one crank. The boiler is to be of steel, built for 140 lbs. working pressure, and is to be 7 ft. 6 in. diameter by 16 ft. 9 in. long, with 140 3-in. tubes 7 ft. 6 in. long.

The four-masted schooner Thallium was launched from the yard of McKay & Dix, Bucksport, Me., last Thursday, without any special exercises in the way of a christening. She is 164 ft. long, 36 ft. beam and 16½ ft. depth of hold. She was built expressly for the cryolite carrying between the Greenland mines and Philadelphia. She will hail from New York and is owned by Capt. C. B. Dix of that city and C. R. Eaton of Parrsboro, N. S. Capt. A. L. Kent of Brewer, formerly master of the schooner Edward Stewart, will command her. The Thallium is the first craft built at Bucksport since 1891. McKay & Dix have on the stocks twin four-masters of about 1,400 tons, for the coastwise trade, which will be launched in October and November.

Besides the new steamship for the Boston Towboat Co., for which the Maryland Steel Co. has begun laying the keel blocks, the company is building three torpedo boat destroyers for the United States government. These vessels, which are far advanced, are the Whipple, Worden and Truxtun. The Metropolitan Dredging Co. of New York is having built there two immense steel dredges. These will have a capacity for 6,000 tons each and will be used in making a 40-ft. channel in New York harbor. A large steel barge is being built for the Pennsylvania railroad, a steel floating dry dock for the United States government. The dry dock will be stationed at Algiers, La., and will be capable of accommodating the largest battleship afloat.

The Maryland Steel Co., Sparrow's Point, Md., has been awarded the contract for the construction of a new steel steamship for the Boston Towboat Co. of Boston. Laying of keel blocks for the new ship has already begun, and the vessel will be completed within twelve months. The new steamship will be built of steel throughout, and will register 3,753 tons gross and 2,930 tons net, with a carrying capacity of 5,300 tons dead weight. The dimensions of the vessel will be: Length over all, 350 ft.; length between perpendiculars, 330 ft. 6 in.; beam, molded, 47 ft.; depth at side, molded, 28 ft.; sheer forward, 8 ft.; aft, 3 ft.

E. C. Brewer, at his ship yard in Elm Park, Staten Island, N. Y., is building a large and substantial floating dry dock for James Shewan & Sons, which will be stationed on the East river. The new dock will be capable of taking out vessels of about 2,000 tons. It is 240 ft. long and 80 ft. wide. It will have twenty-four pumps, two pumps being used for each compartment, of which there will be twelve. In the construction of this dock 700,000 ft. of lumber will be used, besides 50 tons of galvanized iron.

The new four-masted schooner Thomas F. Dennison, another substantial addition to the coasting fleet, was launched from the Dunn & Elliott yard, Thomaston, Me., last week. Official measurements of the schooner are as follows: Gross tonnage, 1,537; net tonnage, 1,376; length, 218 ft. 2 in.; breadth, 43 ft. 7 in.; depth, 19 ft. 7 in. The vessel will have a capacity of 2,000 tons.

Kelley, Spear & Co. of Bath have closed a contract for four barges of 3,000 tons carrying capacity each. The craft will measure 240 ft. in length, 44 ft. breadth and 10 ft. deep. Work will be started upon these vessels as soon as the four-masted schooner Medford is launched, which will be about Sept. 1. The Medford is the 100th craft built by Kelley, Spear & Co.

The place where the big five-masted schooner William C. Carnegie was built in the G. G. Deering yard at Bath was not long unoccupied. The day following the launching of the Carnegie, Mr. Deering had a crew at work clearing away for the keel for a 1,400-ton, four-masted schooner for Capt. E. D. Atkins. The keel is planned and the frame in the yard.

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Sterling Lubricator Co.....Rochester, N. Y.

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Pelton Engineering Co.....Cleveland.

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Jenks Ship Building Co.....Port Huron, Mich.
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Pelton Engineering Co.....Cleveland.
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Swain Wrecking Co.....Detroit.

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American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

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Hyde Windlass Co.....Bath, Me.

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Woods Machine Co., S. A.....So. Boston.

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Drein, Thos. & Son.....Wilmington, Del.
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MARINE REVIEW

VOL. XXII. CLEVELAND, O., AUGUST 30, 1900. No. 9

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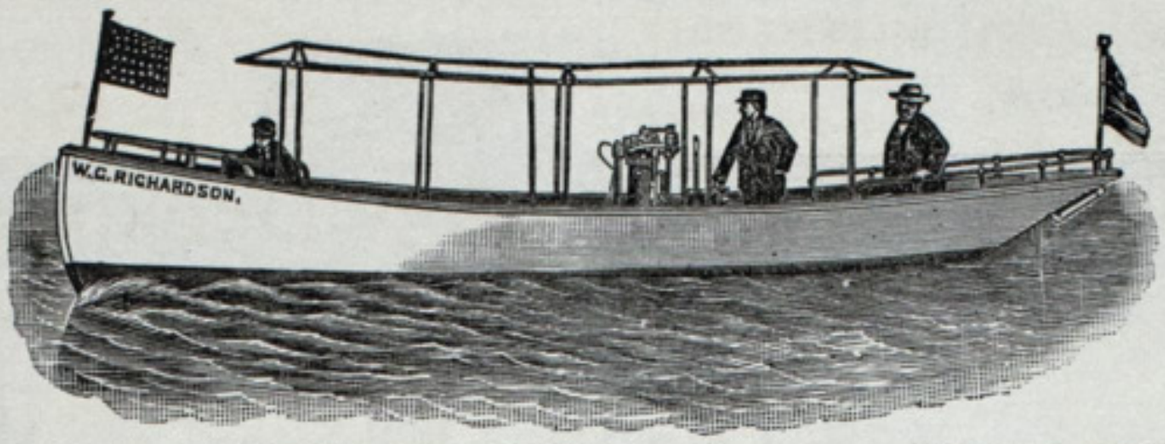

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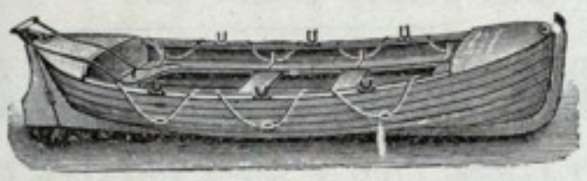

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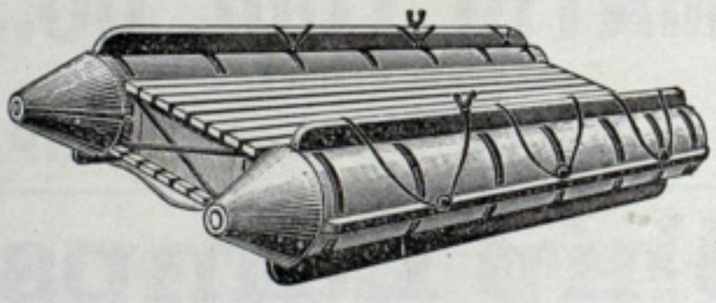

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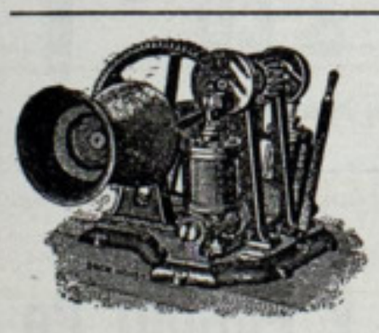

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BOTH HOLLOW AND SOLID, MADE OF THE BEST QUALITY OF CHARCOAL IRON OR STEEL.
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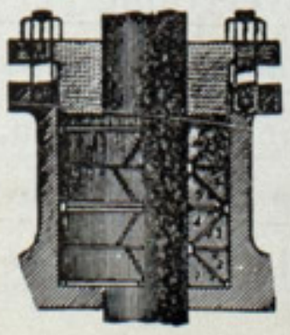

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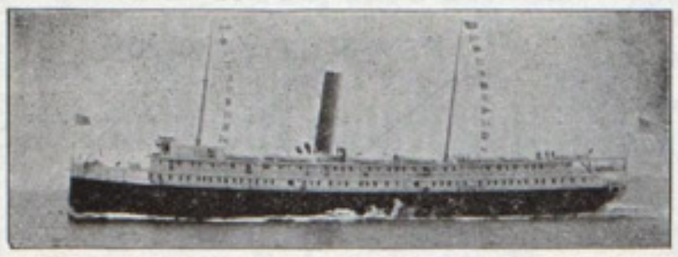

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